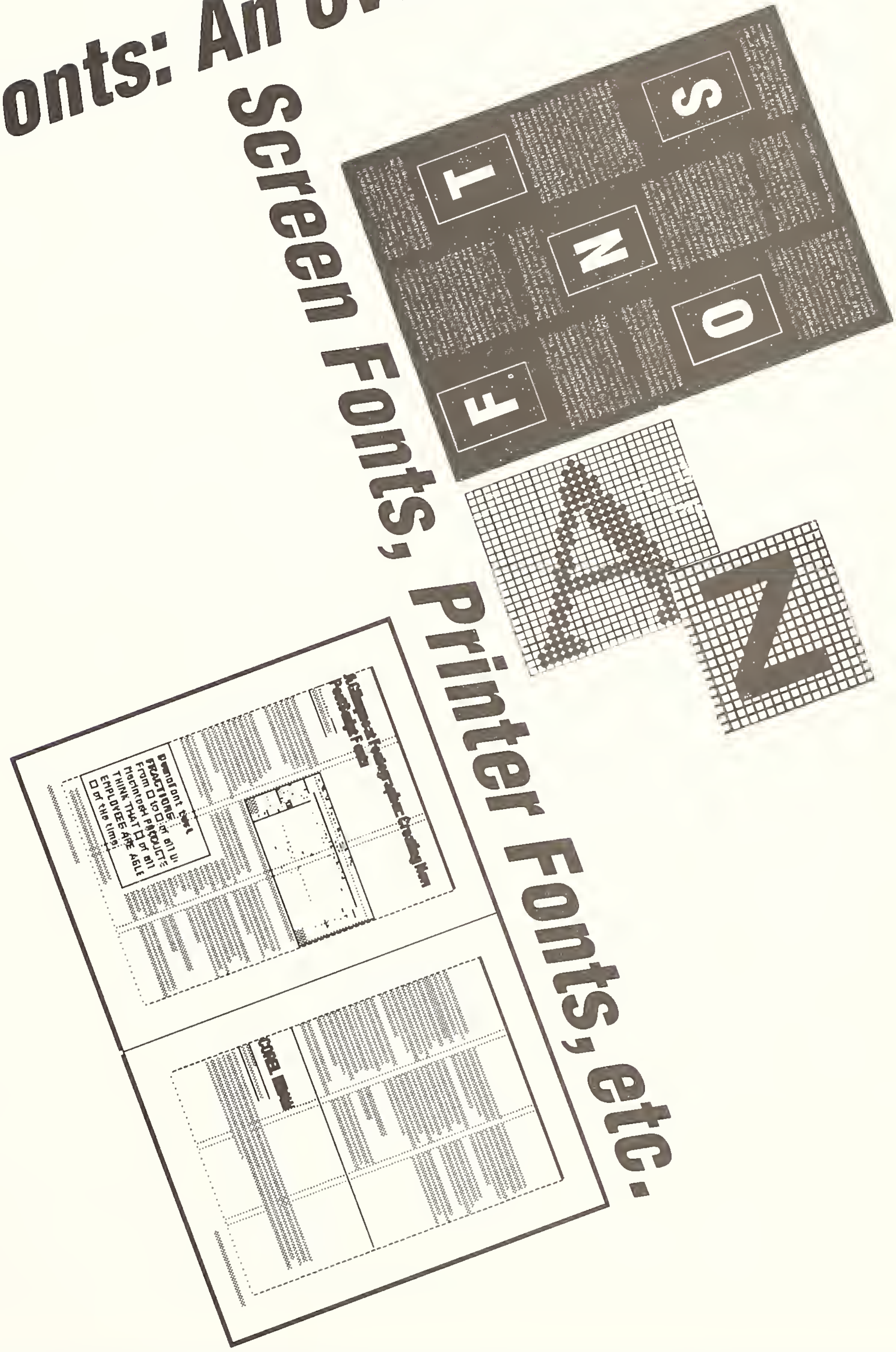
university of toronto
computing services

ComputerNews

Fonts: An Overview

Screen Fonts, Printer Fonts, etc.



ISSN 0315-4661 May/June 1989 No. 255

Contents

Fonts

Fonts: An Overview 1
New Font Alternatives 8
Bitstream Fontware 9
Fonts and Microsoft Windows 10
Fonts on the Macintosh 13
A Glimpse at Fontographer: Creating New Alternatives 18
COREL DRAW 19
Fonts For WordPerfect 5.0 20
Graphics and WordPerfect 23

News

GP UNIX Mail Change 25
PICT Map Collection for the Macintosh 25
WATCOM License Renewal 26
SAS/PC License Renewal 26
WordPerfect Company Changes Support 27

Reviews

Numerical and Scientific Software for Microcomputers 28
TLC Legacy 150 χ2 Tape Backup 33
Do You Need a Right Hand Man 34
Memory Upgrades for the Macintosh 35
Outline Applications on the Macintosh 37
Can a Computer Add? 39
Mega CD-ROM: A Collection of Public Domain Software for the Macintosh 40

Departments

Documents at UTCS 42
Consulting and Enquiries 44
UTCS Directory 44
Committees on Computing 44
UTCS Terminal and Advising Sites 45
UTCS Services 46
UTCS Software List 47

Acknowledgements:

Many thanks to Gwen Foss for assisting in the editing of this issue, and Mark Vanderkam for the editing and layout design of the FONTS section .

Publisher
University of Toronto Computing Services
Toronto, Ontario
Canada M5S 1A1

Editor: Patricia Hood

Publications Assistant: Elizabeth Weitmann

Publication Date: *June 1, 1989*

Subscriptions
Subscriptions run for one year, beginning each January. Changes should be entered on the form at the back of this issue and mailed to *ComputerNews*, 4 Bancroft Avenue, Room 217 (or phone 416-978-4034). FAX: (416)978-6620.

ComputerNews is published eight times yearly by the University of Toronto Computing Services (UTCS). Enquiries should be directed to:

The Editor
ComputerNews
University of Toronto Computing Services
4 Bancroft Avenue, Room 217
Toronto, Ontario
Canada M5S 1A1

Network address:
phood@vm.utcs.utoronto.ca
(NetNorth/BITNET/EARN)

Unless otherwise indicated, network addresses appearing after the author's name pertain to NetNorth/BITNET/EARN.

Permission is granted to reprint articles from *ComputerNews* for noncommercial purposes provided the author, publication, and issue are acknowledged.

IBM PC, PC-XT, PC-AT, Personal System/2, Operating System/2 are trademarks of IBM.
LaserWriter is a registered trademark of Apple Computer.
Lotus 1-2-3 is a registered trademark of Lotus Corporation.
Macintosh 512K, Plus, SE are trademarks of Apple Computer.
Microsoft Word is a trademark of Microsoft Corporation.
PostScript is a registered trademark of Adobe Systems Inc.
SAS is a trademark of SAS Institute Inc., Cary, N.C.
SPSS* is a trademark of SPSS Inc.
UNIX is a trademark of AT & T Laboratories.

This newsletter was entirely produced on a Macintosh using PageMaker and other related Macintosh software.

Fonts: An Overview

John Bradley
bradley@vm.utcs.utoronto.ca

Suddenly there is considerable interest in fonts. This reflects the growing maturity of desktop publishing and presentation technology. People now want to produce documents that use high-quality fonts. At the same time, font issues have added another level of complexity to personal computers. In this issue of *ComputerNews*, we present a series of articles that will give you basic information about fonts so you can manage them more effectively.

Fonts are as old as printing itself. Font design is both an art and a science since it attempts to combine beauty and functionality in each design. There is no single design that suits all texts — all fonts represent a tradeoff between various objectives: some fonts are designed for large display purposes; some look more formal than others; some are easier to read in a conventional paragraph than others. In the international typesetting world, the choice of fonts is very large; there are literally thousands of fonts available for the roman alphabet, for example. The list is not as large for desktop publishing. Still, more than 100 professionally-designed font families are available, mostly for PostScript printers such as the Apple LaserWriter. Typesetting companies and font foundries (companies that develop fonts) invest a large amount of time and money in font design and attempt to protect their designs in various ways. The most popular font names and font designs are copyrighted and owned by a handful of companies worldwide. The most successful desktop publishing font suppliers make arrangements with these companies, and sell authorized versions of these professionally-designed fonts.

How are fonts categorized?

Professional typesetting systems use a variety of categorization schemes. The following is a simplification of their diversity. All our examples use standard fonts that are available on most PostScript printers.

Fonts are grouped in "typefaces" (sometimes called "font families"). Each typeface is given a name:

Times ®
Helvetica ®
ITC Avant Garde ®

Within each typeface is a further subdivision into "fonts":

Times-Roman
Times-Italic
Times-Bold
Times-BoldItalic

Helvetica
Helvetica-Bold
Helvetica-Oblique
Helvetica-BoldOblique

ITC Avant Garde-Book
ITC Avant Garde-Demi
ITC Avant Garde-BookOblique
ITC Avant Garde-DemiOblique

In addition, there are fonts that provide special characters:

Symbols: αβχδεφγ
Zapf Dingbats ®: ☛✔❋✣✼♥
Courier: `abcdef`

Finally, type can be set in different sizes. The type size is measured in "points", with 10 or 12 point being the sizes used for most text.

Times 10 point
Times 12 point
Times 18 point
Helvetica 10 point
Helvetica 12 point
Helvetica 18 pt.

Most desktop publishing fonts are "proportional", meaning that, within any particular font and size, different letters are different widths, i.e., the letter "i" is a different width than the "m". This contrasts with most "computer printer" or "typewriter" fonts, which are monospaced; in these, all letters are the same width.

How are font letter shapes described?

Font designers have traditionally used mathematical principles to describe the shapes of the letters in their fonts. With one important exception (PostScript, see below), this is not the way that computers and laser printers accept a font definition. Instead, almost all computer screen displays and many, but not all, laser printers can only accept font definitions in a form called "bit-mapped."

As an example, assume that you are using PageMaker (on either the IBM PC or the Macintosh) to display text in Times Roman 18 point. PageMaker treats your computer screen as a grid of little dots called "pixels." Each pixel can be either black or white (on colour screens, the options are more complex than this). The dots in the grid are small enough that they can be grouped together to form letter shapes. With enough dots, it is possible to represent the design differences that occur between the form of the same letter in different fonts.

The information that tells the computer how to draw the letter "T", in Times Roman 18 point on the screen, consists of a small grid of computer data indicating whether each position on the screen should be black or white. This grid (and a corresponding grid for each letter in the font) resides in a file called a "screen font file." In *Figure 1*, you can see the letter T, in both Times and Helvetica fonts, as it is stored for display on the Macintosh. Both letters are 18 point: the small letters show them at actual size; the larger versions are the same font enlarged so you can see the dots in the grid. Exactly how PageMaker on the PC or Macintosh locates the appropriate grids won't be discussed here — suffice it to say that for all fonts you can see on the screen in PageMaker, there is a grid pattern that PageMaker has to access so that it knows how to draw the character.

Ultimately, the same technique is used on laser printers (or digital typesetters). The page is divided into a grid, and the electronics in the laser printer must decide which dots in the grid to make black and which to leave white. The important difference between the screen and the laser printer is the number of dots involved. On the screen, a pixel size of about 50 per inch in each direction is pretty good. On the laser printer, however, the standard is 300 dots-per-inch (dpi), and digital typesetters are in the 1200-2500 dpi range. *Figure 2* is a parallel to *Figure 1*, but for a laser printer. It shows an 8 point letter "A" to the left, and a much enlarged grid to the right. Notice that even though the "A" prints much smaller there are a great many more squares in the grid for the laser printer at 300 dpi, than in the grid for the screen at less than 50 dpi.

How large is the grid for any particular letter? Well, this depends on two things:

1. The size of the letter. Note that a different grid is needed for each size. Larger letters require a larger grid with more dots to describe the letters. Hence, a file defining a 120 point font will be considerably larger than one for 12 point.

2. The density of the grid. The same size letter on a 50 dpi screen requires only 1/6 the number of dots in each direction on a 300 dpi laser printer, or 1/36 in total.

Clearly, the definition of a font for a laser printer (stored in a file on your hard disk), if given in terms of a grid, will take up considerably more space than the definition for the same font, in the same size, for your screen.

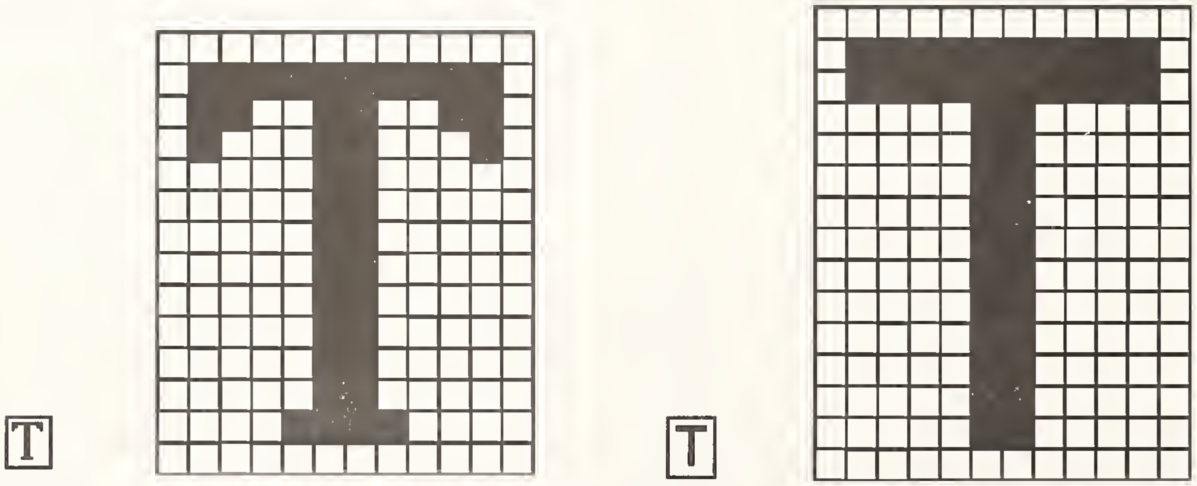


Figure 1: The letter T, in Times and Helvetica 18 point as represented on the screen.

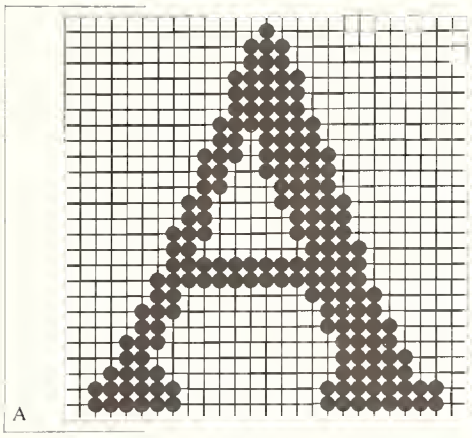


Figure 2: The letter A in Times 8 point, as respresented on a laser printer.

At the beginning of this section we hinted that there was one major exception to the general rule of font characters being defined in terms of grids. That exception is PostScript. A font defined for a PostScript laser printer can be defined mathematically as a shape. See the discussion of PostScript laser printers below.

Fonts and Laser Printers

Personal laser printers provided the momentum for desktop publishing. First there was the Hewlett Packard LaserJet, which became very popular in the IBM PC marketplace, and which is still very popular. For high-quality office printing it was, and still is, a good printer. It is not as well suited for desktop publishing, and the central problem is how it handles fonts. Desktop publishing really started to take off when Apple announced their LaserWriter. Its font handling capabilities are more suited to the needs of desktop publishing, as we will see below.

Printers commonly get font information from three sources, although not all printers support all three:

1. The printer can have a font "built in." In this case, the description of how to draw the font is provided by the printer maker, and can be used by the computer just by naming the font.

2. Some printers can accept a font cartridge. (Hewlett Packard LaserJets are the most popular example of printers that can work this way.) The cartridge contains an electronic description of how to produce one or more fonts. When the cartridge is plugged into the printer, the computer can ask for a font simply by naming it.

3. Most printers can accept a "downloaded" font. In this case, the computer sends a description of how to draw the font characters to the printer. The printer saves the font description and can, subsequently, produce that font when the computer asks for it. Obviously, if a font is downloaded, the font description, in a form the printer can understand, must first be available to the computer that is driving the printer.

If you are using a font that must be downloaded from your computer's hard disk, who does the downloading? Nowadays, most modern software will download fonts for you automatically when you use them. The Macintosh system takes care of this for all Macintosh programs. Similarly, on the IBM PC, Windows will do printer font downloading for all programs that run under Windows.

Both the LaserJet and the PostScript printer family (of which the Apple LaserWriter is one of many) have developed a long way since their original models. However, their font capabilities remain significantly different.

Hewlett Packard LaserJet Printers

The various models of Hewlett Packard LaserJet printers and compatibles vary in their capabilities to handle fonts. However, in general, the LaserJet printer has only a "computer printer" font built into it. If you wish to print more attractively, you must provide the printer with a font definition in one of two ways: on a font cartridge or via a downloaded font (font downloading was not available in the earliest version of the LaserJets).

You tell the LaserJet how to print the characters in a font by giving it the grid of dots for each character in that font. Since the printer prints at 300 dpi, the grid size for even small fonts is relatively large — 30 pixels to a side results in a space only 1/10" square.

Different size fonts on the LaserJet require different grids for the same letters. The downloaded font for Times 10 point is not the same as that for Times 12 point. If you are using downloaded Times fonts and if you plan to use both in a single document, your computer must have one font file for Times 10 point and a different font file for 12 point, and must send both of them to your laser printer.

Similarly, if you are taking fonts from a cartridge, the cartridge must contain a grid set for each size it supports. When you buy a font cartridge (which usually costs between $100 and $200), you will get a few sizes and styles of type. For example, the LaserJet's font cartridge "Z" contains Times and Helvetica fonts in 8 and 14 point regular, and 10 and 12 point regular, bold, and italic.

Instead of getting your fonts from a cartridge, you can purchase downloadable fonts. If you buy a set of downloadable fonts from Hewlett Packard, for example, you will get a set of disks that contain a collection of ready-to-use font files. You copy these files onto your computer's hard disk, ready to send to the printer when needed. Like the cartridges, only a limited number of sizes or font styles will be in a single package.

Bitstream (a major supplier of fonts for the Hewlett Packard printer family) has taken a more general approach. They provide a package that contains two parts: specially encoded files that describe their fonts as shapes, and special software that converts these font shape descriptions into descriptions as grids that the LaserJet understands. For example, if you have their "Swiss" font package, you can ask the program to produce Swiss-bold in 10, 12, 14, and 18 point sizes. Their program will run and produce a set of downloadable fonts in the sizes you request, and store them on your computer's hard disk. (This can be a lengthy process. In a recent experiment at UTCS, on an IBM PC clone, that program ran for over 12 hours.) For more discussion about Bitstream's approach, see the article following.

Although downloadable fonts work perfectly well on HP printers, they take up a significant amount of space. Many people who use the LaserJet with programs like PageMaker have 1 to 4 megabytes (MB) of their hard disks dedicated to storing downloadable fonts in a reasonable number of sizes.

Recently the demands of desktop

Times-Roman
Times-Bold
Times-Italic
Times-BoldItalic

Courier
Courier-Bold
Courier-Oblique
Courier-BoldOblique

Palatino-Roman
Palatino-Bold
Palatino-Italic
Palatino-BoldItalic

ITC Zapf Chancery
ITC Zapf Dingbats: ❁✡✓✂❞●
Symbols: αβχεδφγ!≅#

Helvetica
Helvetica-Bold
Helvetica-Oblique
Helvetica-BoldOblique

ITC Avant Garde-Book
ITC Avant Garde-Demi
ITC Avant Garde-BookOblique
ITC Avant Garde-DemiOblique

New Century Schoolbook-Roman
New Century Schoolbook-Bold
New Century Schoolbook-Italic
New Century Schoolbook-BoldItalic

ITC Bookman-Light
ITC Bookman-Demi
ITC Bookman-LightItalic
ITC Bookman DemiItalic

Times, Helvetica and Palatino are registered trademarks of Linotype Corporation
ITC Avant Garde, ITC Zapf Chancery, ITC Zapf Dingbats and ITC Bookman are registered trademarks of International Typeface Corporation

Figure 3: Standard Built-in Fonts in most PostScript Printers

publishing, and the success of PostScript, have forced the development of significant new options for LaserJet Users. See Terry Jones' article "New Font Alternatives," elsewhere in this issue, for more information.

PostScript Printers

The introduction of the Apple Laserwriter in January 1985 started the desktop publishing revolution. The LaserWriter was the first personal computer printer with professional quality fonts. At the same time, Linotype announced the Linotronic 100, a typesetter that was plug-compatible with the Apple Laserwriter and produced true typeset output. To use the Linotronic, you simply unplugged your Laserwriter and plugged in the Linotronic instead. Any software that could produce Apple LaserWriter output could also drive the typesetter. The quality of the results has proven to be high enough that PostScript output devices are now widely used by professional graphic artists.

Now there are many PostScript printers in addition to those made by Apple. They all share the language, PostScript, that your computer uses to tell them what to print. For desktop publishing applications, PostScript printers have several advantages over other laser printers such as the HP LaserJet:

- Typesetters are available that can produce an exact reproduction of what you see on the laser printer, but at much higher quality.

- A good range (significantly larger than for the LaserJet) of professionally-designed fonts are available for PostScript printers. A reasonable selection is built into the printer (see *Figure 3*).

- Perhaps most interestingly, fonts are described to PostScript printers in terms of their shape, rather than as a grid of dots. The PostScript printer can use this shape definition to print the font in pretty well any size, on demand.

This last point has three important implications. First, since built-in PostScript fonts can print virtually any size, the PostScript printer user has, in a sense, an infinite number of sizes always available with no overhead on his personal computer. Second, in general, fonts defined as shapes take up less space than those defined by a grid, particularly for large type. A downloadable PostScript font will tend to take up less space on your hard disk. Finally, one font definition can be used as the basis for any size type in that font. If you use, say, Garamond 10 and 12 point, the Garamond PostScript font (which is not built into any PostScript printer) would have to be sent to the printer from your computer, but once sent it could be used to print any size.

PostScript printers have different numbers of built-in fonts. *Figure 3* shows the standard set of built-in fonts in most laser printers (the so-called "35 font set"). A few PostScript printers have more fonts built in, a few (mainly older printers) have fewer (the "13 font set" is Times, Helvetica, Courier and Symbol). There are also 85 downloadable font packages available from PostScript's major font supplier, Adobe Systems. They contain, in total, hundreds of different fonts, all of which are professionally designed and produced. Many other fonts are available from other sources.

Fonts on Computer Screens

Although fonts are an issue for your laser printer, they also can have an impact on your personal computer as well. Any program that produces typeset or pseudo-typeset output on a laser printer needs to know how to use the fonts provided for that laser printer. However, computer users today expect more — they want to see what their documents will look like on the screen before they print them, using so-called WYSIWYG (What You See Is What You Get) displays. This means that there must be provision not only for letter shapes for the printer to print, but also for different letter shapes to be shown on the screen.

WYSIWYG font representation has always been available on the Macintosh. Since the Mac was first made available, it allowed you to select a type style from a list of fonts and would show that style to you on the screen. The Mac operating system provides such services to all programs, and no Mac software developer has to develop screen font support entirely for him- or herself. On the IBM PC, however, this development has been more recent, and is gradually becoming more important. Screen font display and management is one of the roles of software called "presentation managers," which include Windows, GEM, and, in OS/2, and Presentation Manager. These pieces of software sit between the client program and DOS and, from the client program's point of view, provide the basic screen display management services that DOS does not provide.

In *Figure 4*, we can see a representation of the relationship between Windows and PageMaker on the PC.

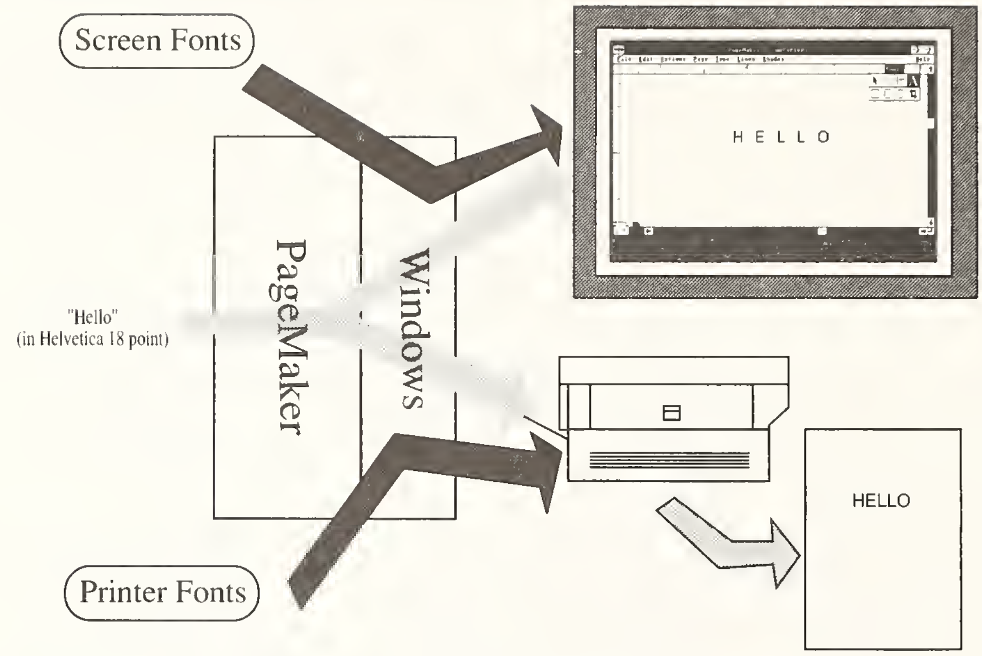


Figure 4: The relationship between fonts and software.

If you give PageMaker the text “Hello” and tell it to show the word in Helvetica 18 point, it will tell Windows to draw “Hello” on the screen for you. Window’s Screen Driver will get the appropriate letter grids from Screen Font files for Helvetica, and will display the letters on the screen (shown in *Figure 4* in the top right corner). Similarly, if you then ask PageMaker to print the same text, Window’s Print Driver will (if necessary) send the printer font definition for 18 point Helvetica to the printer, and then will tell the printer to use that definition to print “Hello”, resulting in a page similar to that shown in the bottom right of *Figure 4*. Essentially, PageMaker on the PC uses Window’s services to handle both the screen and the printer. Ventura Publisher uses a system called GEM to perform similar functions. A few programs, such as WordPerfect 5.0, also attempt to provide a WYSIWYG preview. WordPerfect 5.0 does not use Windows or GEM; it handles all the display issues itself.

Usually, the description of a font used by a printer is different from the one the computer will use to display the font on the screen. Thus, if you are using a program with a WYSIWYG display, you’ll need two font definitions for each font. Screen fonts must reside on your hard disk to allow the presentation manager to access them. Printer fonts that are not built in or contained on a cartridge will also have to be stored on your hard disk.

The lack of a single standard way to display fonts on the screen can be a real nuisance on the IBM PC, since the font file formats used by each display manager are different. If you use both WordPerfect 5.0 and PageMaker (which uses Windows as a display manager) and you want to use WordPerfect’s preview mode, you will need font definitions for both systems, essentially duplicating information on your hard disk.

In other font-related articles in this issue, we take a closer look at how different display managers handle font issues. See “Fonts and Microsoft Windows,” Fonts for WordPerfect 5.0,” and “Fonts on the Macintosh,” following.

Display Postscript: The Way of the Future?

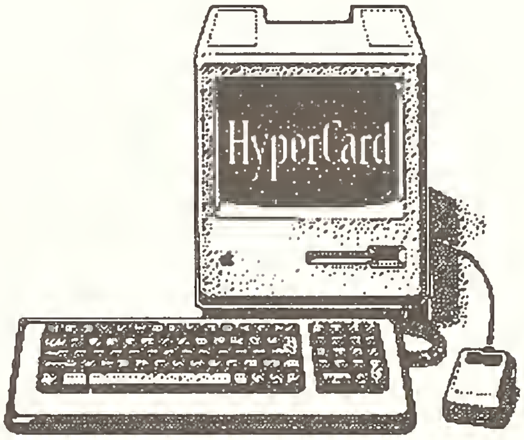
The fact that the display on the screen is generated using different font descriptions from those used in the printed output means that screen displays are not really WYSIWYG, but “WYSISOWYG”: What You See (on the screen) Is Sort Of What You Get. Recently, a new product called “Display PostScript” was made available to computer manufacturers, and the first product that uses it, Steve Job’s NeXT computer, is just now on the market. On the NeXT computer, the PostScript language is used to describe the image both on the screen and on the laser printer. The same PostScript font file can be used to generate the display and the printout.

Why has the same imaging model for both the printer and the screen not been used on the Macintosh, or within Windows on the PC as well? Well, remember that both the screen and the laser printer page are, ultimately, viewed as a grid of pixels. PostScript fonts are described as outlines, and are converted to the grid format when they actually need to be printed or shown on the screen. On PostScript printers, this conversion takes a moment or two. Although the conversion is easier for the screen, because there are fewer dots per inch, it would still take a noticeable amount of time. No screen user would want to wait a moment or two for their display to appear while the computer prepares the grid images for the fonts being displayed. Display management systems on the Mac or PC need to respond quickly, and it takes considerably less time to move the grid version from a font file to the screen than to take an outline, figure out what the grid version is, and then display it.

However, as computer chips get faster and more sophisticated, more complex computations can be done quickly, reducing the time the computer user has to wait. The NeXT is a sufficiently powerful computer that the display can be generated relatively quickly, even though a considerable amount of computation must be done to create it.

Will Display PostScript be the next standard for displays? We feel it is still too recent a development to know. Furthermore, some potential competition to Display PostScript is potentially appearing on the horizon (i.e., Miscrosoft's GPI, proposed enhancements to Apple's QuickDraw). You won't see Display PostScript as standard equipment on today's versions of Macintoshes or IBM PC's; if it is to become a standard, it will be for the next generation of computers.

HyperCard Seminar



Many people have been asking about HyperCard – What is it? Should they be interested? For those who wish to learn this package, UTCS has developed an introductory seminar on HyperCard and its capabilities. The seminar will cover basics only, with Participants learning to create and modify simple stacks. It is suitable as preparation for the more advanced HyperCard course offered by Apple's ARPP program here at U of T.

HyperCard Seminars scheduled to date are: **June 19 and 20**
10:00a.m. - 12:00 noon

To register in the seminar, please call Irene Rosiecki at 978-4565. For more information about the seminar's content, please contact John Bradley at 978-3995.

New Font Alternatives

Terry Jones
tj@vm.utcs.utoronto.ca

A number of new font alternatives have recently become available. Hewlett Packard has released a program called Type Director Software. This program, like the Bitstream Fontware software, lets you make fonts in any size from 4 to 200 points. We have not seen this product yet but reviews of it indicate that it is faster at creating fonts and easier to use than Bitstream software. Hewlett Packard is providing this program free with LaserJet printers until July 31, 1989.

In the past, most font cartridges for LaserJet printers contained one or two typefaces in a few small sizes. (The average font cartridge contains 25 fonts.) Hewlett Packard has released a new font cartridge, called ProCollection, that contains 65 fonts. If you are looking at cartridges, and need a larger variety of fonts, this cartridge might be worth looking into. As with the Type Director Software, this cartridge is available at a discount with laser printers purchased before July 31.

Bitstream Fontware and Hewlett Packard Type Director Software produce both screen and printer fonts. The high-resolution printer fonts can consume large quantities of disk space. Keeping track of fonts used in a document, as well as the fonts already downloaded to the printer, can be confusing. Also, downloading fonts every time you print can be very time-consuming. Two possible alternatives are available.

The Glyphix LaserJet fonts are a software-only solution for Microsoft Word 5.0 or WordPerfect 5.0. This software installs screen fonts for either Word or WordPerfect, and creates printer fonts as they are needed, using resident software. The printer fonts are automatically and transparently sent to the printer. Glyphix claims the performance (speed) is quite good. This is a low-cost solution: the installer is US$79 and each font set is US$99.

LaserMaster offers a hardware font alternative for people who already own Canon CX- or SX-based laser printers (i.e., LaserJet or LaserJet Series II). Their solution is a board that plugs into your PC and connects to your laser printer. When you print, the board creates the printer fonts as they are needed (from Bitstream font outlines) and sends them to the printer on the fly. A second LaserMaster product will create the screen fonts for GEM, Windows, and Presentation Manager applications including Ventura Publisher and PageMaker. These will give you accurate screen representations of your fonts for a true WYSIWYG display. These hardware font alternatives are expensive — $3500 for the printer font board and $2000 for the screen font board — but they may give both Display PostScript and PostScript strong competition in screen and printer font handling.

We hope to evaluate these products in the near future. For further information, contact Terry Jones at 978-4924. ▨

Bitstream Fontware

Terry Jones
tj@vm.utcs.utoronto.ca

Bitstream is probably one of the most well-known suppliers of fonts. They recently bundled complete, functional samples of their fonts with WordPerfect 5.0 and PageMaker 3.0 (IBM PC version). Bitstream sells fonts for both PostScript and non-PostScript printers, but the most common use of Bitstream fonts is with Hewlett-Packard and compatible laser printers (PCL-type printers).

Bitstream screen fonts are mathematical descriptions similar to PostScript fonts. These descriptions are transformed into bitmap screen fonts using the Bitstream Fontware software. You choose the typeface, size, and orientation, and the Fontware creates bitmap printer and screen fonts from the outline descriptions of the fonts. The Fontware program automatically installs the screen fonts for your software. For Windows, this involves placing the screen font files in the Windows directory and updating the WIN.INI (Windows initialization) file properly. For WordPerfect 5.0, the screen fonts are installed in the printer resource file. (WordPerfect uses the screen fonts for View Document only. You do not see proper screen fonts while entering your text.) The printer font files are placed on your hard disk so they can be downloaded to your printer either before printing or automatically when your machine is started. With Windows, you use the Soft Font Installer to select which fonts are to be sent to the printer and whether they are to be sent each time or just once at startup. With WordPerfect 5.0, you use the Control Printer section of the program to select the download options.

The Bitstream instructions are complete, the whole process is relatively easy to do, and the quality of the screen and printer fonts is excellent. However, the time needed to create fonts can be staggering. Using a very slow PC compatible (4.77MHz PC clone with a slow hard disk) took over an hour to create a 72 point screen and printer font for a low resolution dot-matrix printer. A selection of regular, italic, bold, and bold italic in 18, 36, 72 and 144 point sizes was a 12 hour undertaking. Spending a few minutes deciding which sizes of type you **really** need is a very important and time-saving step in the operation of creating fonts. This point is stressed in the instructions and should be heeded.

The amount of time it takes to send bitmap fonts to the printer can be quite long, especially with a high-resolution laser printer and large type sizes (24 point and higher are large). Once again, the Bitstream instructions warn you of this.

The Bitstream fontware allows you to make fonts with different character sets. Some of the character sets match the normal Hewlett-Packard Roman 8 character sets; others include the basic ASCII character sets (alphabetic letters and punctuation) with none of the extra characters. For the large type sizes, Bitstream recommends using the smallest character set possible to reduce the size of the font files produced. This has a four-fold advantage to you. The files take less disk space, they download faster, they use less printer memory (allowing more fonts in use at one time), and they also take less time when created in the first place. This approach may not be possible if you need the extra characters of the larger character sets, such as accented or line-drawing characters. Once again, this requires some careful planning before you actually make fonts.

As mentioned earlier, Bitstream is making a sample of their product available to WordPerfect 5.0 and PageMaker 3.0 users. PageMaker comes with the Bitstream Fontware disks and complete instructions for use. Our WordPerfect 5.0 came with an offer of Bitstream Fontware. All we had to do was contact the distributor to have it sent to us. Newer versions of 5.0 may come with it included. The Fontware provided with PageMaker indicates it is for PCL printers only, but we have successfully used it with dot matrix printers, producing good-looking large fonts on a very inexpensive printer.

The Bitstream Fontware is high-quality software that can produce some stunning fonts at reasonable cost with minimal pain! If your printer doesn't have what you need, then Bitstream might be able to provide it. For more information about using the Bitstream Fontware software, contact Terry Jones at 978-4924. ▨

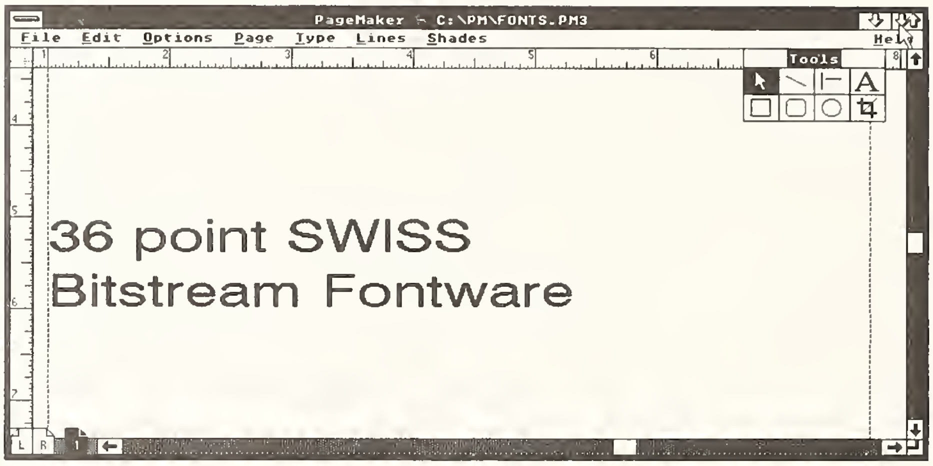
Fonts and Microsoft Windows

Terry Jones
tj@vm.utcs.utoronto.ca

Microsoft Windows is capable of displaying different fonts and font attributes on your IBM PC or compatible screen. Many techniques and resources are required to do this seemingly simple task.

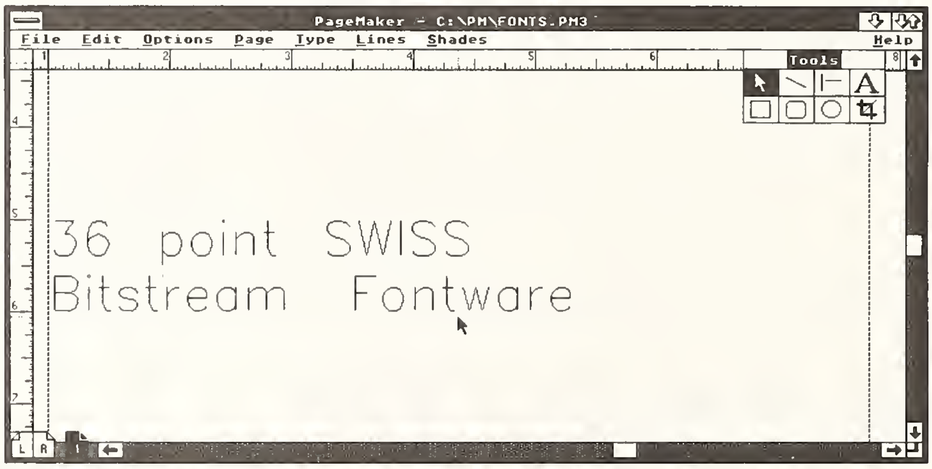
Windows uses four techniques to display fonts on screen: greeked fonts, bitmap screen fonts, stretched bitmap screen fonts, and vector fonts. There are up to three components in a font for Windows: the screen font, the printer font, and the PFM or Printer Font Metric. (These are all contained in individual files in the Windows environment.) The printer font may not be needed if the font is built into (resident in) the printer.

The screen font file contains information, in the form of bitmap data, for each character of one size in the font. For accurate representation, you need a screen font for every size type you are using in your document, as well as a screen font for each page view your software is capable of displaying. This means that if you chose a 36 point type for a headline, then want to view the page at 200% on screen, you need a 72 point screen font. The same applies to 50% and 75% views. This means that you require 4 different representations of a screen font just to display one type size and style. Another four representations are required for italics (oblique) of the same size type! Fortunately, Windows has a technique for making screen fonts appear bold, thus eliminating the need for another four representations for bold. Further


PageMaker - C:\PM\FONTS.PM3
File Edit Options Page Type Lines Shades Help
Tools

36 point SWISS
Bitstream Fontware

Figure 1


PageMaker - C:\PM\FONTS.PM3
File Edit Options Page Type Lines Shades Help
Tools

36 point SWISS
Bitstream Fontware

Figure 2

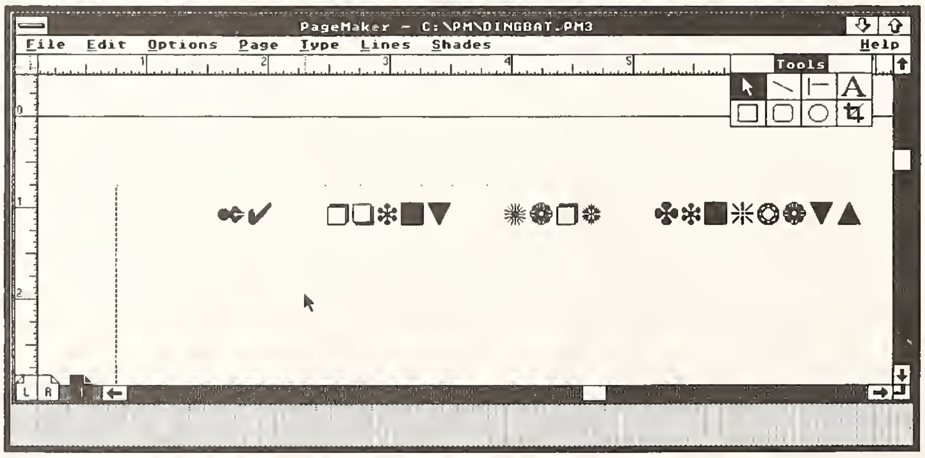

PageMaker - C:\PM\DINGBAT.PM3
File Edit Options Page Type Lines Shades Help
Tools

Figure 3

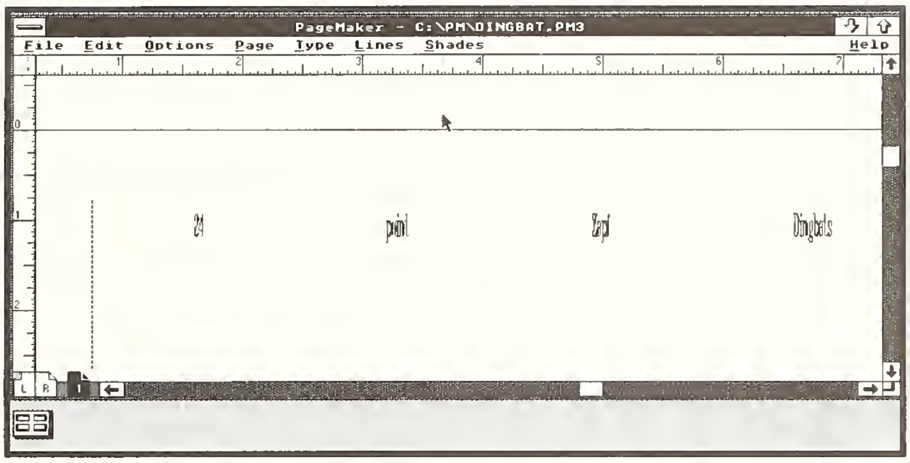

PageMaker - C:\PM\DINGBAT.PM3
File Edit Options Page Type Lines Shades Help
24 point Zapf Dingbats

Figure 4

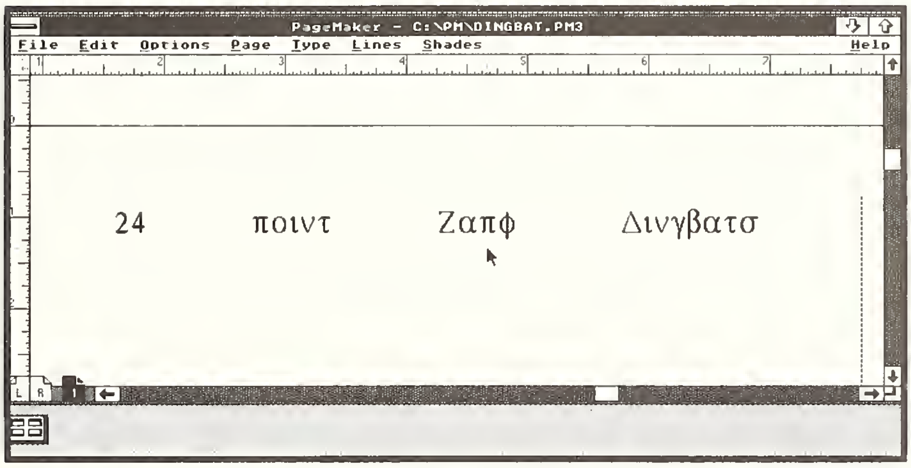

PageMaker - C:\PM\DINGBAT.PM3
File Edit Options Page Type Lines Shades Help
24 ποιντ Ζαπφ Δινγβατσ

Figure 5

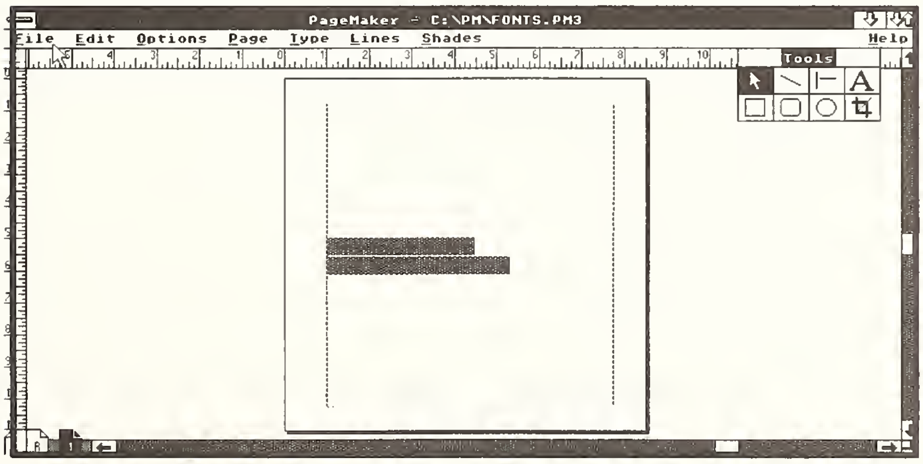

PageMaker - C:\PM\FONTS.PM3
File Edit Options Page Type Lines Shades Help
Tools

Figure 6

reductions in the number of screen fonts are possible because of duplication of sizes: a 36 point screen font at 50% view is the same as an 18 point screen font at 100% view.

The advantage of having a large variety of screen fonts available is that the screen more closely represents the printed page (see *Figure 1*). The disadvantage is cost, which comes in many forms. Screen fonts can consume large quantities of disk space. The higher the resolution of your screen, the more information needed to display each character. The larger the screen font, the more disk space you use. For example, a 30 point screen font for an EGA screen is approximately 100 kilobytes! You may also have to purchase screen fonts. Most of the screen fonts provided include a limited selection of sizes, usually up to about 24 point. If you need larger screen fonts, or specific sizes of screen fonts, then you may have to go to a font vendor and purchase the needed screen fonts.

If you do not have a proper screen font for a particular size or view, then Windows uses a variety of techniques to display your selection. One of these techniques is called stretching. This is where the font is stretched vertically to approximate the size of the chosen font. In order to do this, Windows needs a proportionately smaller screen font to stretch. If you have no 48 point screen font, then a 24 point screen font could be stretched to the same height. The width of the characters is not stretched so, although the words are positioned correctly at the beginning of each line, you will not have a very good idea of how things will print.

Another technique Windows uses is vector fonts, often called stroke fonts. These take a generic stroke font and scale it appropriately, as in *Figure 2*. The stroke font is a form of mathematical definition of the shapes required to display the character. This definition is easy to scale to the desired size. Unfortunately, this can lead to poor performance from the microcomputer, since more time must be spent doing calculations to perform scaling. Another problem is that the bases for the stroke fonts are one or two standard definitions that come with Windows and may not accurately represent the font in use. *Figures 3* and *4* make this quite clear. The vector fonts are plain readable text and look nothing like Zapf Dingbats.

If you select a font that is available in your printer but for which you have no screen fonts, Windows uses one of its standard generic fonts to represent it. This may be close enough for some applications. *Figures 3* and *5* also show where this approach may not work well at all. Windows used the Symbol screen font when no Zapf Dingbats screen font was available. They are just *slightly* different!

Greeking, as shown in *Figure 6*, is another technique used by Windows for font display. When text is greeked, it is replaced on the screen by rectangular boxes that are approximately the size of the text. This is most commonly done at reduced views and for very small type sizes where the screen resolution is not sufficient for reasonable display of characters.

The Printer Font Metric file contains information that Windows uses to more accurately display the characters on screen. This file is usually supplied by the font vendor and the installation program usually installs the font metric file automatically. Without the font metric file, character placement on the printed page will not be as good.

Printer font files are to the printer what screen font files are to the screen. Printer font files are needed when your printer does not have the required font(s) builtin. Windows can be set to automatically send (download) these printer font files to your printer just before printing, or your system startup files (AUTOEXEC.BAT) can be modified to send them to the printer when you start your machine. These downloadable fonts can bring enhanced functionality to printers, but often at a price. Cost of the fonts is only one aspect. The time to download these to the printer can be long, especially with high-resolution laser printers and large type sizes. These files also consume large quantities of disk space on your PC. Printer capacity (usually memory) often limits the useable sizes of downloadable fonts to 30 points or less.

Where to Purchase Fonts

There are a number of sources for both screen and printer fonts for Windows. The two most common suppliers are Adobe and Bitstream.

Adobe, the makers of PostScript, supply sets of screen fonts that match the fonts built into PostScript laser printers along with an installation program designed for Windows. They also sell printer and screen fonts for additional typefaces. UTCS has a complete set of Windows screen fonts for all of the fonts that are available in PostScript printers containing 13 font families (Apple LaserWriter Plus, IINT, IINTX, QMS PS800+, 810, NEC LC890, etc.). These were downloaded from the Compuserve Adobe forum and are available free. If you want to get copies of these fonts, contact Terry Jones at 978-4924 to make arrangements. The Adobe forum on Compuserve has many more screen fonts; as well, Adobe sells complete sets of screen fonts for a very modest charge.

Bitstream is probably one of the most well-known suppliers of fonts. They have recently included complete functional samples of their fonts with WordPerfect 5.0 and PageMaker 3.0. The previous article in this issue discusses Bitstream fonts in more detail.

continued...

Font Installation

Font installation for Windows is normally a matter of placing the screen font and printer font metric files in the Windows directory and updating the Windows initialization file, WIN.INI. Both of these tasks are handled properly by the various font installation programs we have used. One thing to be aware of is that the fonts you install are only installed for the current printer selected in Windows. If you have a number of different configurations for the same printer, the Windows Control Panel can be used to install these fonts in the other configurations.

Font Creation

While there are thousands of typefaces available, these are never enough. Font editors are available for those of you brave enough to tackle the task of creating your own font. WYSIfonts, SoftCraft Font Editor, Publisher's Type Foundry and FontGen IV+ are font utilities that allow you to create and/or edit downloadable fonts for Windows. The amount of time needed to properly create your own font from scratch is immense! This point cannot be stressed enough. Editing an existing font to add a character or two is a feasible task, but generally not worth the expense of the editing software (usually between $120 and $600). ▨

Fonts on the Macintosh

Geoffery Rockwell
rockwell@gpu.utcs.utoronto.ca

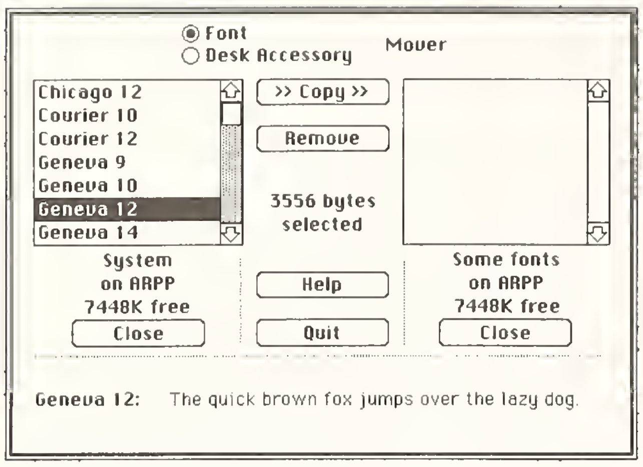
The Macintosh has excellent font capabilities because fonts are handled by the operating system. If you load a font into the system, it is available in most applications. To use fonts effectively on the Mac, you need to know how to load fonts into the system and how to use them within your applications.

Loading Fonts

There are two types of fonts for the Mac: screen fonts and PostScript fonts. Screen fonts are for screen display and for printing on an ImageWriter, while PostScript fonts are for printing on PostScript laser printers. Screen fonts must be loaded into the operating system to be used. To use PostScript fonts, you also load a screen equivalent that invokes the appropriate PostScript font when printing.

To load fonts to or remove fonts from the operating system of the Macintosh, you must use the Font/DA Mover. The Font/DA Mover is a utility provided with every Macintosh on the disk called "Utilities 2" (in older versions it is on the "System Tools" disk). Make sure you use the version of this utility that is compatible with your system. If you are using the most recent system (System 6.0.2, Finder 6.1), use version 3.8 of the Font/DA Mover (see *Figure 1*).

With the Font/DA Mover, you can load screen fonts into the system on your startup disk, be it a hard drive or floppy drive system. You can also copy fonts from system to system or from system to font files. The font files look like suitcases with the letter A on them. You can't use a font file



Geneva 12: The quick brown fox jumps over the lazy dog.

Figure 1: Font DA Mover 3.8

by itself; it has to be opened with the Font/DA Mover in order for its contents to be transferred into the system before it can be used.

Once a screen font is loaded, you do not need the font file in order to use the font. It is important to realize that loaded fonts are part of the system — they are, in effect, invisible — and this makes them available in other applications. When you copy a system, the fonts loaded as part of that system are copied as well.

When loading a font into the system, you are loading one size of a specific typeface. If you want to see both the 9 point and the 12 point sizes of the Helvetica typeface, you have to load both sizes. If you load only the 12 point size, your Mac will calculate the 9 point using the 12 point font as a guide. The calculation inevitably results in chunky-looking letters (see *Figure 3*).

You do not load PostScript fonts into the system. Instead, you load their screen equivalents, which are provided with most PostScript fonts and printers. Then you copy the PostScript font file into your system folder. The screen equivalent allows you to see an approximation of the printed font, while the PostScript font file in your system folder gets downloaded to your PostScript printer when necessary. Certain PostScript fonts, such as Times and Helvetica, are already built into the Apple LaserWriter. For these, you don't need the PostScript font file in your system folder, you need only to have loaded the appropriate screen font using the Font/DA Mover as described above. The printer will print using the PostScript version of the screen font, providing much higher quality output.

For example, suppose you want to work with the Avant Garde font. On the disks provided, when you buy a LaserWriter, there should be screen equivalents of the most commonly used sizes of Avant Garde. Load the sizes you need into your system and use them when preparing documents. The laser printer will automatically replace the screen equivalent with its PostScript font.

Using fonts

Using loaded fonts is straightforward as most programs on the Macintosh act in a similar fashion. In MacWrite, there are two menus entitled Font and **Style**. With the **Font** menu you control the typeface, and with **Style** you control both the size and style of any character. With these two menus you can control the appearance of all the text in your document.

In the **Font** menu you choose the general appearance, or typeface, in which the text will appear on the screen and in which it will print. (One of the most common problem users have is understanding the difference between these two. See "Viewing Fonts" below for details.)

Fonts are designs of characters, each with a distinguishing name and with attributes that help determine their use. Typical fonts on a Mac are the following:

Chicago; Courier; Geneva; Helvetica; Monaco; New York; Times.

To view the fonts installed in your system, use the **Key Caps** desk accessory, which comes with every Mac (see *Figure 3*). When you choose it from the **Apple** menu ( ), it puts a new menu item, called Key Caps, to the right of the other menus for your application and it also displays a picture of the keyboard in a new window.

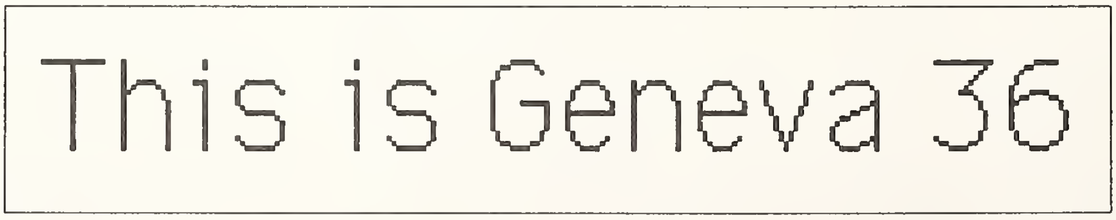

This is Geneva 36

Figure 2: Note that the curves appear chunky. If a Geneva 36 font had been loaded into the system, this would look better.

The Key Caps menu is a list of all the fonts loaded in your system. Selecting a font shows you the keyboard and what each key will print in that font. Holding down the Shift key, the Option key, or a combination of the two will show you other characters that are available.

Under the **Style** menu, you control the size of the letters in a font. For example, this is Helvetica 9 point, and this is Helvetica 14 point. Here are some of the standard point sizes:

9 Point, 10 Point, 12 Point, 14 Point, 18 Point, 24 Point

As you change the height of the letters, you also affect the height of the lines in MacWrite. If you set the font to be Times 12 point, the line height will, unless otherwise specified, be set by MacWrite. MacWrite takes into consideration whether you want single or double spacing.

With the **Style** menu you can set the style of the text also. The standard styles are **Bold,** *Italic,* ***Bold Italic,*** Underline, Outline, and Shadow. You can combine different styles to achieve special effects.

Microsoft Word does not handle fonts in the same way. It has a short list of fonts and styles available under the **Font** and **Format** menus respectively. If fonts that you know are loaded do not appear in those short lists, go to the **Character...** dialog box under the **Format** menu. In the **Character** dialog box, you can add fonts and styles to the **Font** menu by holding down the **Command** key, the **Option** key, and the "+" key. When a large "+" sign appears, you click on the desired font or style to add it to the **Font** menu. Command-Option "-" can be used to remove fonts and styles from the **Font** menu. See your Microsoft Word manual for details.

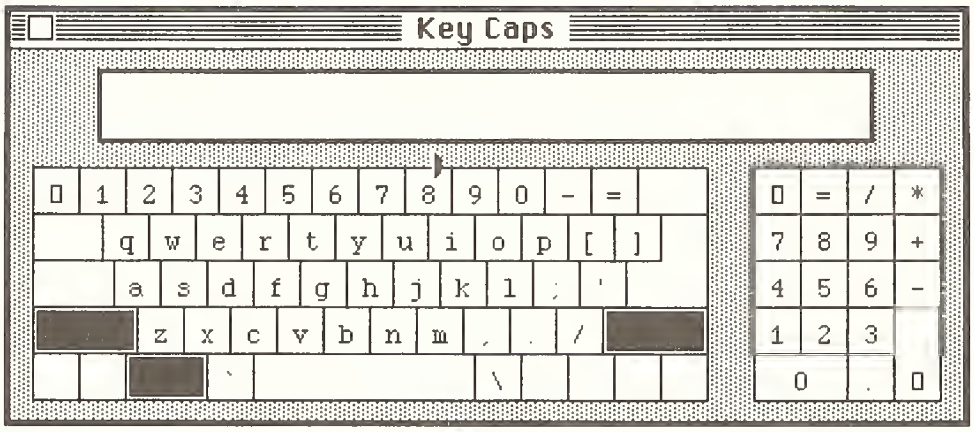


Figure 3

In MacWrite, Microsoft Word, and other word processors, you can see any combination of fonts, styles, and sizes on the screen at one time. This means you can have a document with text in italic, a quote in Ancient Greek, and headings in a bold, large size. All this is visible on the screen and will print on either an Apple ImageWriter or LaserWriter, if the appropriate screen and printer fonts are correctly loaded. Being able to see what you are going to get when you print makes editing and proofreading easier, though small point sizes can be difficult to read on the screen.

Viewing Fonts

Occasionally you may want to use one font for viewing a document on screen and another for printing. Geneva is a standard typeface for viewing text on the screen. It is not the screen equivalent for a PostScript font, but it looks good at three in the morning when your eyesight is failing. Times, on the other hand, is a "sober," "academic" PostScript font that prints well on a laser printer. It does not look as good as Geneva on the screen because it was created to approximate the printed characters. For this reason, many people compose their documents in Geneva and, before printing, transform them into Times or another PostScript font. (Unfortunately, some people fail to distinguish between screen and printer fonts and thus get poor printing results. See "Printing Fonts" below.)

Printing fonts

Printing multi-font files is not a problem if you use any of the Apple printers. The relationship between what you see and what you get depends on the printer you choose to use. This is where most people get confused. When you print on an ImageWriter, you are using the screen fonts to print. When using a

PostScript laser printer, such as the Apple LaserWriter, you are printing with the PostScript equivalent of the screen fonts. However, the screen fonts loaded in your system do not necessarily have PostScript equivalents. As an example, see *Figure 5* for some of the standard fonts that are loaded when you buy your Mac.

Only three of these screen fonts have PostScript definitions built into the Apple LaserWriter: Courier, Helvetica, and Times. The other four, while easier to read on the screen, are not built into the LaserWriter, and will not print as well as genuine PostScript fonts. They will print, but not smoothly. All of these fonts will print on an ImageWriter.

Printing with an ImageWriter

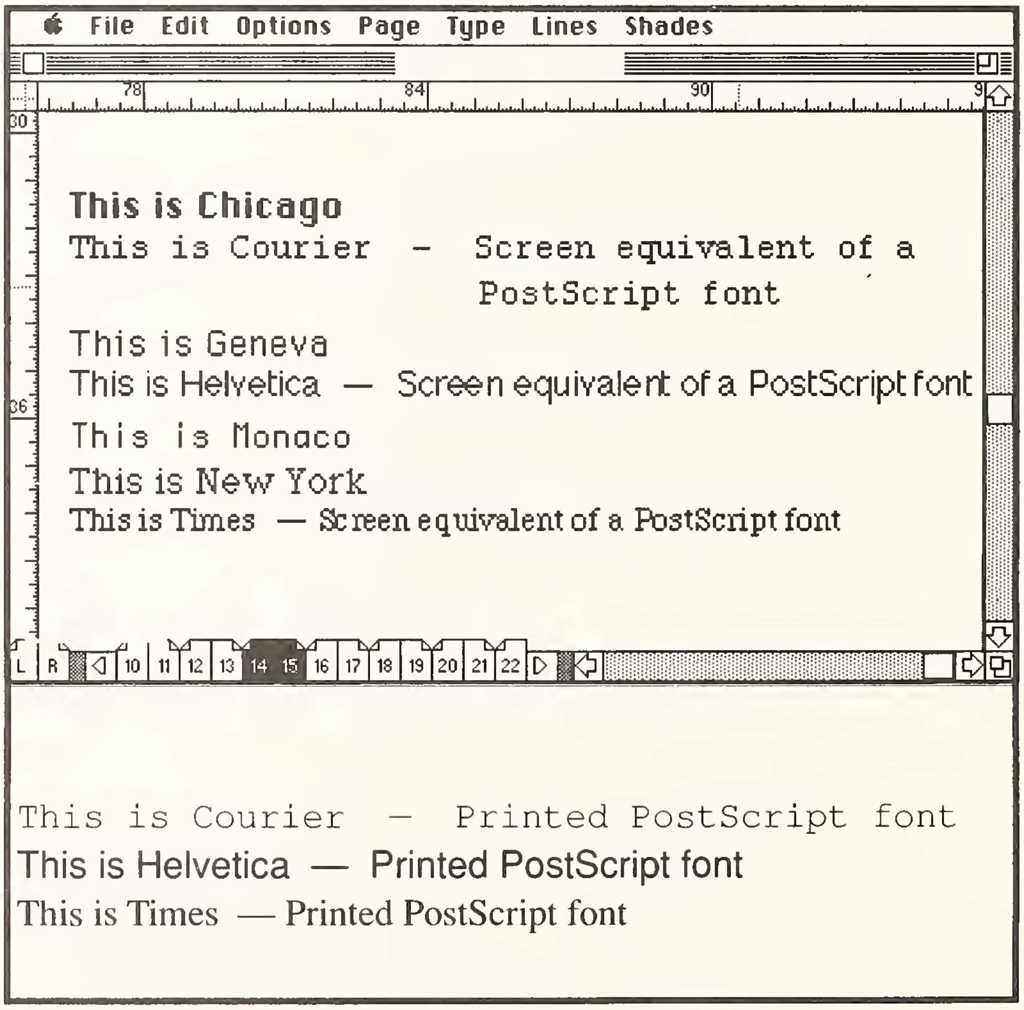
There are three printing modes when using the ImageWriter: Best, Faster, and Draft. The ImageWriter prints literally what appears on the screen in Faster or Best mode. It prints using the screen font loaded into your system, assuring an exact, pixel-for-pixel print of the document as it appears on screen. Even if you have an exotic font, like Devangari, there should be no surprises when printing. The only exception is when you print in draft mode. In draft mode, the ImageWriter does not use screen fonts and consequently you lose exotic characters. Draft mode is used to speed up printing of files where an exact image of the screen is not necessary.

For attractive output on the ImageWriter, use Best mode with MacWrite. Best mode takes a font size that is double the size of the characters it is printing and uses that scaled by half. This means that there is twice the resolution to the text. This only works if you have loaded a font that is twice the size of the one you are using in your document. So, if you want to print Geneva 12 point in best mode, make sure you have Geneva 24 loaded too.

Printing with an Apple LaserWriter (or other PostScript Printer)

Printing on the LaserWriter or any other PostScript printer is subtly different. The strength of the LaserWriter is that it can print with fonts of greater resolution (number of dots per square inch) than you can see on your screen. To insist that the LaserWriter print what you see, is to not take advantage of its superb resolution. If you do, you are asking it to act like a "$7000 ImageWriter."

The LaserWriter makes certain decisions about which fonts to use and when to use them. Any text in a font that is a screen equivalent of a built-in font will be printed using the PostScript font, not the screen font. The substitution means that the printed text will be smoother and of a higher quality than what you see on the screen. The substitution will not affect your file or what you see.



This is Chicago

This is Courier - Screen equivalent of a PostScript font

This is Geneva

This is Helvetica — Screen equivalent of a PostScript font

This is Monaco

This is New York

This is Times — Screen equivalent of a PostScript font

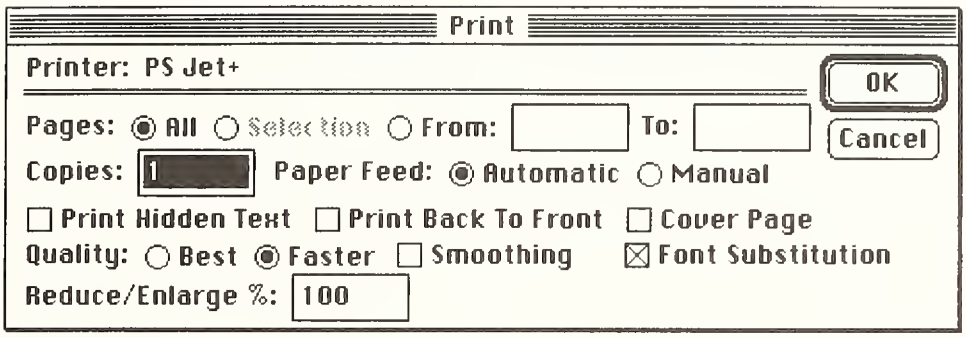
This is Courier — Printed PostScript font

This is Helvetica — Printed PostScript font

This is Times — Printed PostScript font

Figure 5: Comparison of Screen and Printer Fonts.

If the PostScript printer encounters text in a font that is not built-in, it can do one of three things, all of which are controlled in the print dialog box (see *Figures 6 and 7*).



Print

Printer: PS Jet+

Pages: ● All ○ Selection ○ From: To:

Copies: 1 Paper Feed: ● Automatic ○ Manual

☐ Print Hidden Text ☐ Print Back To Front ☐ Cover Page

Quality: ○ Best ● Faster ☐ Smoothing ☒ Font Substitution

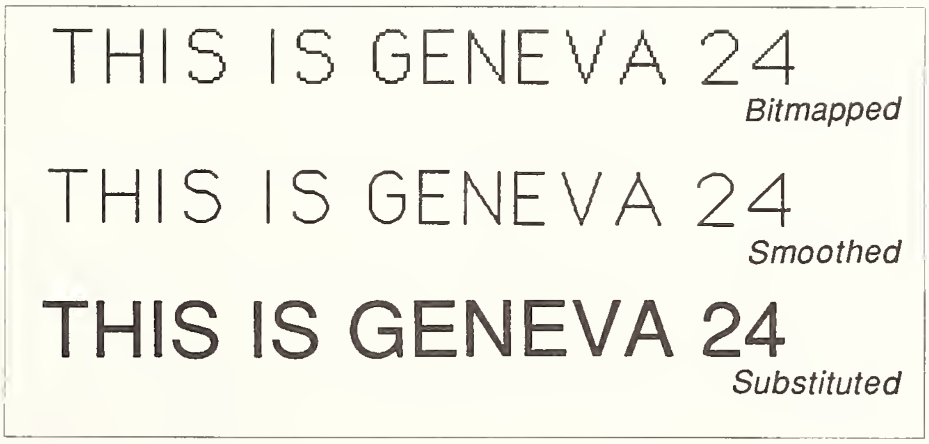
Reduce/Enlarge %: 100

Figure 6

1. It can create and print with a bitmap version of the font that is just like the screen version. In this case, you get ImageWriter-quality printing.

2. If you turn on **Smoothing**, it will also create a bitmap, but it will try to smooth the curves and diagonal lines. Most of the time this improves the output, but sometimes it smooths away features you want to retain.

3. Finally, if you turn on **Font Substitution**, the LaserWriter will try to substitute a PostScript font for the offending bitmapped font. This only works for fonts, such as Geneva, that the system knows about. For example, London will not be replaced by Times. Font Substitution may also move your text around, as the font used in the substitution will occupy less space on the page. This option should be avoided if you are concerned with the precise placement of text, as in the creation of tables and in desktop publishing. If you are worried about the placement of text, then you should either avoid the **Substitution** feature or use the screen equivalents of the PostScript fonts available in your printer.



THIS IS GENEVA 24

Bitmapped

THIS IS GENEVA 24

Smoothed

THIS IS GENEVA 24

Substituted

Figure 7

To make sure that you get high-quality printing from a laser printer, you should do the following:

1. Use the screen equivalents of the fonts loaded in the laser printer. If you use the Apple LaserWriter or an equivalent, match the fonts you are using with those on the LaserWriter or LaserWriter Plus.

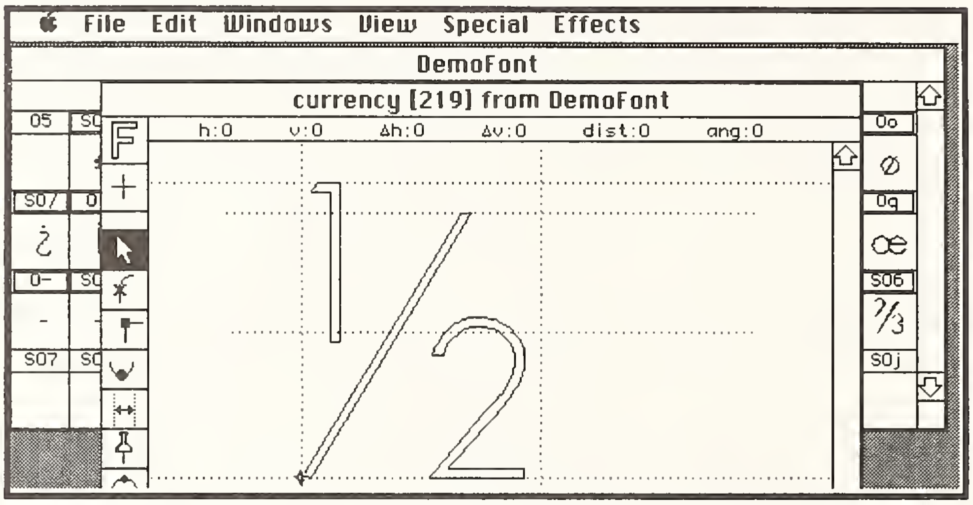
2. Copy the "Laser Prep" and "LaserWriter" files into your system folder and choose "LaserWriter" in the Chooser before creating your document. Do this even if you do not have a LaserWriter connected to your Mac. Doing this informs the application that this document is intended for a laser printer and will have an effect on the placement of the text. You can always change back and forth between the ImageWriter and LaserWriter using the Chooser. If you do so, be prepared for differences in the placement of text on the page.

You can also use downloadable PostScript fonts. In this case, you copy the PostScript font files into the system folder of the Mac from which you will print (as described earlier) and load the screen equivalent into your system. If you use the screen font when creating the document, the word processor should automatically download the PostScript font file to the laser printer when it is needed. Call 978-HELP if you are having problems with downloadable fonts.

A Glimpse at Fontographer: Creating New PostScript Fonts

Michael LeBlanc
mleblanc@uoguelph.ca

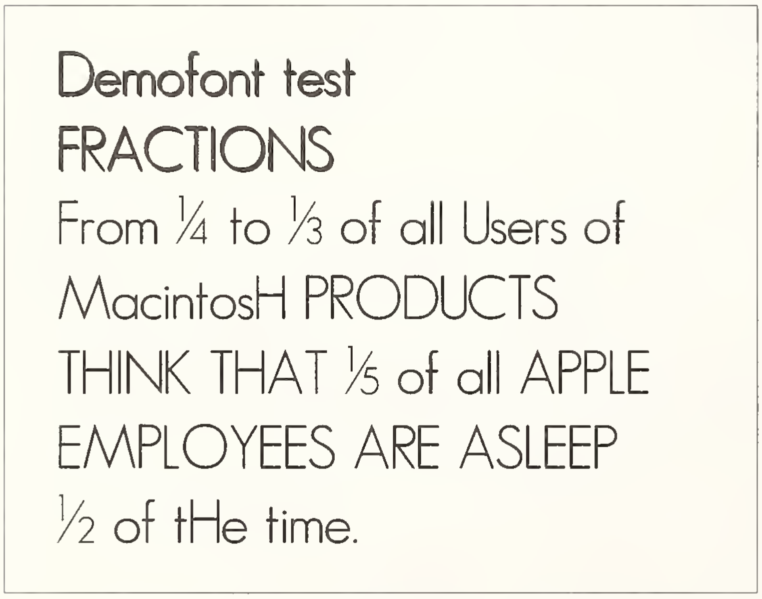
(On Wednesdays, Michael LeBlanc is a Lecturer in the Department of Art as Applied to Medicine, Faculty of Medicine; on Thursdays, he works as a Graphic Designer in the Text and Imaging Group at UTCS.)



The Fontographer at work, building a composite fraction character.

Have you ever needed special characters for non-Roman languages? Or do you find yourself using decimal fractions when you really want the real McCoy? Many writers have occasional requirements for characters that are not included in any regular PostScript font, but these special character sets retail $100-$250 each.

Last year I helped a professor typeset a 300-page book. He used references from Spain, France, Germany, Holland, Denmark, and Czechoslovakia. One of the text characters he used for his Czech references was a lower case "c" with a horizontal line over it—a letter that is unavailable in any of the LaserWriter fonts. I could have purchased a Czech PostScript face for $150, but since the manuscript called for only ten special c's, it wasn't worth the investment. I had to stroke the letters by hand after they came off the laser printer, but if I'd had Fontographer, I would have been able to create a new character in a matter of minutes.



Demofont test
FRACTIONS
From ¼ to ⅓ of all Users of
MacintosH PRODUCTS
THINK THAT ⅕ of all APPLE
EMPLOYEES ARE ASLEEP
½ of tHe time.

A test of the DemoFont typeface, using the newly created composite fraction characters.

Fontographer, from Altsys Corporation, is a Macintosh program that allows you to create your own special purpose Postscript typefaces. It bills itself as a "professional font editor," which means that you can alter existing fonts or create your own from scratch.

Creating a New Typeface

If you are an Aldus FreeHand user, you will be familiar with the drawing tools of Fontographer (Altsys created

FreeHand). Like other PostScript drawing programs, you describe the outline of the object you want to create and Fontographer fills in the shape. The advantage of using outlines to draw objects is that they can be scaled larger or smaller without a loss of resolution. To do an "O", for instance, you merely draw one circle inside the other. The big circle describes the outer edge of the letter, and the smaller circle describes the inner edge.

To help you in the creation process, you can load in a template from a scanned image (as in a logo) and use the template as a tracing guide. Or, you can use other fonts—any fonts that are in your system—as templates. This is a particularly powerful feature; it is possible to combine elements of a LaserWriter font (Helvetica, for example) to create a composite letter.

Intelligence (or some might say, intuition) has been added to help you in the tracing process. When making a 180° curve, for instance, Fontographer adjusts the curve automatically. A properly traced letter therefore needs very little refinement.

When you have finished composing your new typeface, Fontographer allows you to save your work in several different forms. The actual outline font contains the editable outline descriptions that Fontographer uses. From that file you can generate the PostScript font file that is downloaded at printing time. Fontographer also saves a bitmap font file in Font/DA Mover format for loading into your system file.

Downloading Options

To print with your new font, you load the bitmap version into your system using the Font/DA Mover and drag your PostScript file into your System Folder. Then you print your document. The PostScript font is automatically downloaded and used for printing. If you use a number of different downloadable fonts in your document, each one is loaded into the printer as it is needed.

If you choose, you can use the Download program to manually install your font into your printer. It remains in the printer's memory until you reset or turn off the printer.

At approximately $400, Fontographer is a reasonable, relatively easy-to-use alternative to purchasing special PostScript character sets. ▨

COREL DRAW

Terry Jones
Jones@vm.utcs.utoronto.ca

COREL DRAW is to MS-DOS computers what Adobe Illustrator is to Apple Macintosh computers. It is a graphic illustration program that allows you to create high-quality graphics to include in your publications. COREL Draw works with HP LaserJet, HP PaintJet (colour), PostScript, and other printers. It requires at least an 80286-class computer (e.g., an AT), a mouse, and Microsoft Windows. COREL Systems has made an attractive offer to University of Toronto departments interested in acquiring this program. Interested departments should contact Terry Jones at 978-4924, immediately, for details. ▨

Fonts for WordPerfect 5.0

Geoffery Rockwell
rockwell@gpu.utcs.utoronto.ca

There are three issues to handling fonts in WordPerfect 5.0:

1. Which fonts can your printer produce?
2. Which fonts can you see when previewing a document?
3. Which fonts can you see when editing?

To work effectively with fonts in WordPerfect 5.0, you must understand the answers to these three questions.

What Can Your Printer Print?

Whatever WordPerfect claims to be able to do, you are limited by what your printer can print. When working with foreign characters and different fonts, it is important to first explore the capabilities of your printer. Most printers will have, in their manual(s), a list of the characters and fonts they can print.

Certain printers will allow you to download fonts to the printer or to put in new font cartridges. In these cases, you are limited by the fonts you can obtain for that printer. For example, PostScript laser printers typically can print using 13 different typefaces or fonts. They can also print using downloaded fonts, providing even more choices. When you acquire a downloadable font, like those produced by Bitstream, it will come with a program that installs the appropriate files on your hard drive. See the article about Bitstream fonts in this issue for more information.

Which Fonts Can You Preview?

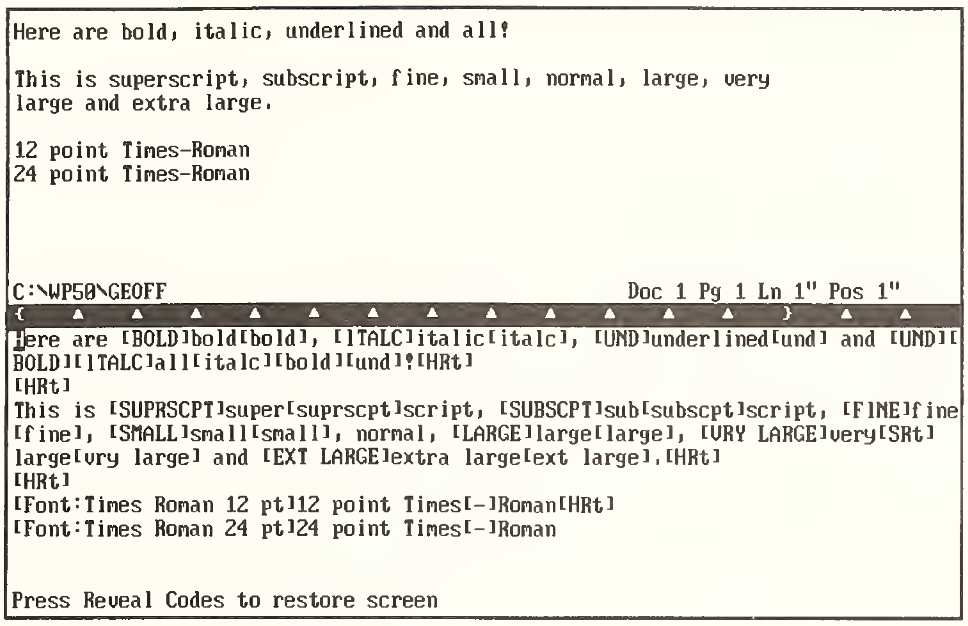
Once you know what your printer can print, you should make sure that WordPerfect can use the fonts in the printer. One way to check is to preview the document. To preview, press <Shift><F7> to access the Print menu, followed by <V> for View Document. The accuracy of the preview depends primarily on having the correct printer definition selected. If you are not getting what you think you should be getting, it may mean you do not have the correct printer definition selected or that you don't have your preview fonts installed correctly.

You can select printer definitions by pressing <Shift><F7> for the Print menu, followed by <S> for Select Printer. If your printer does not appear in the list of printers, then you can look for it on the WordPerfect Printer disks using <A> for Additional Printers and <O> for Other Printers. If an appropriate driver is not available on any of the printer disks provided by WordPerfect, then you should call us at 978-HELP for assistance in locating a driver. Once your printer is listed, you can select it. Selecting a printer tells WordPerfect which of the available printers you think you are going to print on.

Using the appropriate printer driver allows WordPerfect to calculate how the printed page will look so that your preview is accurate. If you are previewing a page to be printed on a PostScript printer, WordPerfect needs to have a preview version of each font used in your document. This preview font is invisible to you — it is installed when you install the fonts the first time. The preview version is not what you see while editing nor what will be used while printing. If your printer is correctly selected but the preview feature does not seem to work, try reinstalling your fonts. Read the font manuals carefully.

What Can You See When Editing?

WordPerfect calls each specific combination of typeface, appearance, and size a font. Helvetica Bold 12 point is a different font from



```
Here are bold, italic, underlined and all!

This is superscript, subscript, fine, small, normal, large, very
large and extra large.

12 point Times-Roman
24 point Times-Roman




C:\WP50\GEOFF                                      Doc 1 Pg 1 Ln 1" Pos 1"
{   ▲   ▲   ▲   ▲   ▲   ▲   ▲   ▲   ▲   ▲   ▲   ▲   }   ▲   ▲
Here are [BOLD]bold[bold], [ITALC]italic[italc], [UND]underlined[und] and [UND][
BOLD][ITALC]all[italc][bold][und]![HRt]
[HRt]
This is [SUPRSCPT]super[suprscpt]script, [SUBSCPT]sub[subscpt]script, [FINE]fine
[fine], [SMALL]small[small], normal, [LARGE]large[large], [VRY LARGE]very[SRt]
large[vry large] and [EXT LARGE]extra large[ext large].[HRt]
[HRt]
[Font:Times Roman 12 pt]12 point Times[-]Roman[HRt]
[Font:Times Roman 24 pt]24 point Times[-]Roman


Press Reveal Codes to restore screen
```

Figure 1: Reveal Codes mode

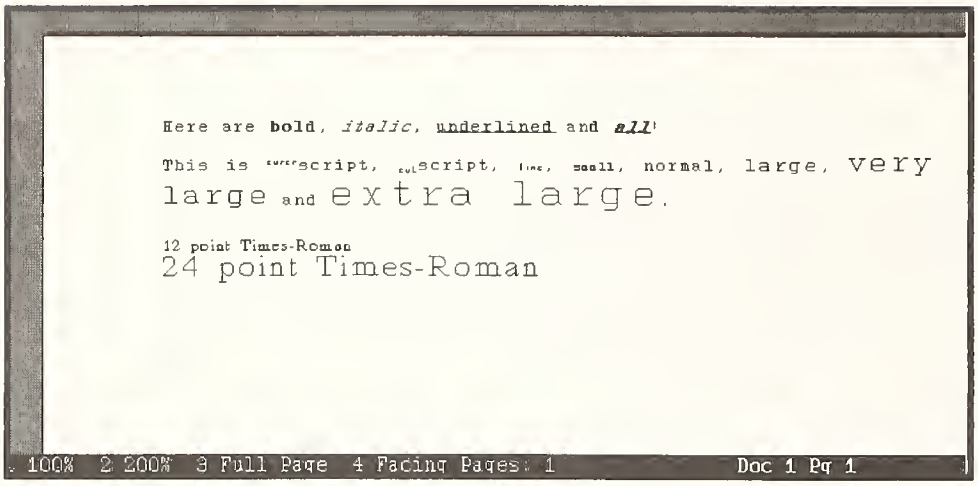
Helvetica Italic 12 point. While the typeface or font family is the same, the style or appearance of the two fonts are different. There are two ways of changing fonts in WordPerfect: you can specify the exact combination of typeface, style, and point face, or you can change only the size and appearance without specifying the exact combination. For example, if you want to change from Helvetica Normal 12 point to Helvetica Italic 12 point, you can either specify a new font or just say you want the italic style of whatever you are already using. For this reason, in the Font menu (<CTRL><F8>), you can change either the size, the appearance (style), or the base font. Changes to the size or appearance are relative changes; they affect whatever font you had as the initial setting or base font. Changing the base font sets all three attributes.

All of these settings should preview correctly but they will not necessarily show while editing. What you see on screen while editing is often, unfortunately, not what will print. You can see, strictly speaking, only one font or typeface while editing. What you see is a screen editing font that cannot be changed and has no relationship to the typeface that will be used when printing, unless your printer uses a similar typeface. It is, however, an easy font to read on the screen, and WordPerfect tries to make sure that line and page breaks appear accurately, based on the typeface you have chosen.

For this reason, if you change typeface from Times to Helvetica, a code is inserted to instruct the printer to change typeface, but you will not see either font unless you preview the document. There is no indication of the font selected on screen unless you look through the codes in the Reveal Codes mode (<ALT><F3>) (see *Figure 1*). The only visible difference will be where the lines and pages break. Again, previewing will display everything correctly.

While you are limited to the monospaced screen typeface for editing, you can see changes in the size and appearance of the screen font. What you see will depend on the video display adapter you have, the monitor you have, and the initial display settings. There are two ways that you can change what you see. First, you can change the hardware to display the attributes you want to see. The Hercules Graphics Card Plus can, for example, display text in different sizes and styles (appearances), as well as superscripted (see *Figure 2*). An EGA card, on the other hand, will force you to choose which style you want to see displayed correctly. Second, you can change the initial display settings in order to see various attributes, such as bold, italic, and underline. If you are limited by your hardware, WordPerfect will allow you to choose which attribute you want to see correctly and which you want to see in another colour. You can choose which you would prefer to see in the Display Options menu. The display options will vary according to the video system you have and whether it has been set correctly. If you have an EGA card and a colour monitor, you can choose between seeing as many characters as possible or seeing a single style correctly. You select the mode using <Shift><F1>, <3> for Display and, finally, <2> for Colours/Fonts/Attributes.

There is an ambiguity in WordPerfect's use of the term font. They give you a choice to use the "Underline font - 16 colours." This does not mean that you see a different typeface, it means that you can see underlining in the regular screen typeface. Text that is underlined will not appear in another colour but actually underlined. Changing the typeface of what you see is, as mentioned before, not possible in WordPerfect.



Here are **bold**, *italic*, underlined and ***all***!

This is superscript, subscript, fine, small, normal, large, very large and extra large.

12 point Times-Roman
24 point Times-Roman

Figure 2 : Text displayed in different sizes, styles and appearances can be depicted using the Hercules Graphics Card Plus.

Foreign Characters

An issue related to font handling is that of displaying and printing foreign characters. You can enter foreign characters using Compose (<CTRL><2>, character set number, character number). (See your manual for more details.) Displaying and printing foreign characters is not a question of changing the font but, rather, of changing the character set. There are 13 character sets that are theoretically visible in WordPerfect. Seeing them depends on your video card and initial display settings. Entering and seeing a character does not guarantee that you can print it. It will only print correctly if the printer resource file defines it and if your printer can print it. Previewing the document will not accurately indicate if foreign characters will print. Some characters display correctly in View Document but are not printable; others do not appear in View Document but print well. If the correct code is in place and if your printer can print it, then it should print.

Summary

- When working with different characters and fonts in WordPerfect, you should first consider which printer you will be using and make sure it can print what you want. Install the correct printer resource file and select it to make sure that what you type produces the desired result and displays accurately in View Document.
- When editing text there are three issues: will the desired character display on the screen and print, will fonts or font attributes display on the screen, and can relative attribute changes be made?
- Use Compose to ensure the correct character codes are entered in the document. Whether or not you can see the characters, if the code is correct and the printer resource is correctly installed, and the printer is able to print it, then the character should print. Seeing the character as it should print will depend on the character and your initial display settings.
- While all you will see when editing is the standard screen typeface, you can see the typeface underlined, in italics, or in bold. Which styles you see will depend on the hardware you have. Previewing, on the other hand shows everything correctly. Previewing shows the fonts as they will print.
- Changing size and appearance is, strictly speaking, a font change, but WordPerfect allows you to make relative changes. A relative change affects the base font being used without inserting a new font code. When you turn on underlining (<F8>), you do not insert a new font code but modify the previous one.▒

Graphics and WordPerfect 5.0

Terry Jones
tj@vm.utcs.utoronto.ca

One of the more important new features of WordPerfect 5.0 is the ability to include graphics from a variety of sources in documents. These graphics can include drawings, paint files, CAD files, or scanned images, and are inserted in your text in much the same manner as a table or footnote. In order to work easily and efficiently with graphics in WordPerfect, you need special hardware to display and print them.

Displaying Graphics

To display graphics on a monitor, you need a video adapter card that can display text and graphics. We call this type of video adapter card a "graphics" card. Graphics cards provide varying degrees of functionality at a broad spectrum of cost. The inexpensive Hercules Graphics Card, combined with the TTL monochrome monitor, provides crisp, clear text display as well as high-quality graphics display. Hercules-compatible adapter cards are available for under $100, providing an inexpensive but functional alternative for use with WordPerfect.

An Enhanced Graphics Adapter (EGA) card or a Virtual Graphics Array (VGA) card, and an appropriate colour monitor, will also provide high-quality text and graphics display. Text display is not quite as sharp and clear as for the Hercules card, but the colour display has advantages. WordPerfect 5.0 will display text attributes such as bold, italics, and underline in different colours, allowing you to see the formatting in a document without using the Reveal Codes or View Document functions. The big drawback to these combinations is the cost. With EGA and VGA adapter cards selling for $300-$600, and colour monitors for $500-$1000, the combination often costs more than the computer itself!

Other options are the Hercules Plus and Hercules InColor cards with the RamFont feature. This feature allows many different styles of characters to be displayed on the screen at one time, including large and small characters, italics, and underlining. It also displays superscripted and subscripted text! The Hercules Plus card works with the inexpensive TTL monochrome monitor, while the InColor card uses an enhanced colour display. Both provide graphics capabilities.

Printing Graphics

To print the graphics and fonts in your document you need some form of graphics printer. Depending on the quality required, this can be anything from a $249 dot-matrix to a $6000 laser printer. There are many things to consider when choosing a printer. Speed, fonts, and print quality all affect the price. One important factor often overlooked when choosing a printer is that it should be a supported printer, i.e., WordPerfect should provide a "printer driver" for it. In the past, it was not out of the question to create a driver for your printer if WordPerfect did not provide one. While still not out of the question today, printer drivers are necessarily more complex in order to handle graphics and a wider variety of fonts. This makes it extremely difficult to create your own driver from scratch. It is also very important that WordPerfect be configured properly, as well. Numerous problems and much frustration can result from incomplete, incorrect printer drivers. If your printer is not listed on the printers included in your WordPerfect package, do not give up! There are now ten supplemental printer disks provided by WordPerfect. To find out if a driver for your printer is available on one of these supplemental disks, contact Geoff Rockwell at 978-4548.

Graphics and Early Releases

Early releases of WordPerfect 5.0 incorrectly handled some forms of graphics files. Also, some files created in the early releases could not be successfully retrieved in the later, more stable WordPerfect 5.0.

If you experience difficulties importing or working with graphics, contact UTCS at 978-5601 to obtain the most recent release of WordPerfect 5.0.

Sources of Graphics

Once you have a display that can show graphics, a printer that can print graphics, and a version of WordPerfect 5.0 that can correctly import graphics, then all you need to produce interesting documents is the graphics!

The first source of graphics is WordPerfect itself. A number of sample graphic files are supplied on the WordPerfect Fonts and Graphics disk. These files have the extension ".wpg". You can purchase more of these "clip art" type graphics directly from WordPerfect and other sources. You can also use graphics from Lotus 1-2-3, paint programs, illustration programs, and scanners. UTCS has an image scanner that you can use to scan drawings and photographs. These can then be saved on floppy disks and taken to your office for placement in your WordPerfect 5.0 documents. UTCS makes available the U of T coat of arms in a file format suitable for use in WordPerfect 5.0 and in desktop publishing programs for the PC and Macintosh. It is available from the Advising Office at 978-HELP.

A Caution about Printing Speed

Graphics can take a very long time to print. High-resolution image files are often very large and can reduce the printing speed from pages per minute to minutes per page! Options on the WordPerfect 5.0 Print Menu allow you to select the graphics quality desired. Lower quality graphic printing can greatly speed up printing. High quality will slow it down, but is often necessary for final copies. ▨

GP UNIX Mail Change

Steve Younker
younker@vm.utcs.utoronto.ca

If you have been using our GP UNIX system, you may have noticed a subtle change in the address header in your outgoing mail. In April, the address in the "From:" line of your outgoing mail changed from

gpu.utcs.toronto.edu

to

gpu.utcs.utoronto.ca

This change reflects the growing use of the .CA top-level domain name for Canadian nodes. The change of address should not create any difficulties for people trying to contact you. Anyone able to contact you using the .EDU top-level domain name should still be able to contact you using the .CA domain name. However, it is possible for sites to be unaware of the existence of the .CA domain. If your colleagues encounter problems sending you mail, they should contact their system administrators in order to bring their installations up to date. (It should be noted that the GPU.UTCS.TORONTO.EDU address is still valid and can be used by those sites that have not been brought up to date. However, we urge everyone to use the .CA-style address whenever possible.) If you have a "signature" file containing the old .EDU address, we encourage you to change it to the .CA-style address. If you have any questions regarding this change, please feel free to contact Steve Younker by electronic mail at **younker@gpu.utcs.utoronto.ca.** or by telephone at 978-6346.

PICT Map Collection on Macintosh

Geoffrey Rockwell
rockwell@vm.utcs.utoronto.ca

UTCS now has a collection of maps in electronic form for Macintosh users. These maps are PICT documents with provinces and states stored as separate objects. For example, in the map of Canada (right), each province is a separate object that can be cut and pasted into a word processing, desktop publishing, or graphics application. The maps available are:

- Africa
- Asia
- Canada
- Europe
- North America
- South America
- South Pacific
- USA (48 states)
- USA (50 states)
- USA timezones
- World

These maps are in the public domain and are available in the UTCS Microcomputer Lab. Call Mary Wilson at 978-5601 to arrange to copy these files.

WATCOM License Renewals

The annual UTCS licenses for WATCOM products expire June 30, 1989. This affects all registered WATFOR-77, WATFOR-87, GKS, and WATCOM C users.

Registered users will receive a License Renewal Contract by the first week of June. If you have not received your contract or if you are a University member interested in licensing the products from UTCS, please contact Irene Rosiecki at 978-4565.

A full review of the new features in both WATCOM C and FORTRAN will appear in the July/August issue of *ComputerNews*.

SAS/PC License Renewal

We would like to remind all our SAS/PC licensees that the current license for the product expires on June 30,1989. If you want to continue using SAS/PC, you must renew the license. That is the "bad news." The good news is that, thanks to the large number of licensees, the individual costs are going down. The following fee schedule will apply from July 1, 1989:

Basic package (base + STAT + GRAPH):	$70
SAS/FSP	$10
SAS/IML	$20
Basic package (for networks)	$35 for each machine

We will send letters to all licensees in the near future to detail the renewal procedure.

WordPerfect Company Changes Support

Gwen Foss
pubscoop@vm.utcs.utoronto.ca

Are you a new WordPerfect (WP) user looking for help or advice? An experienced user desperately trying to keep up with the latest updates? If either of these descriptions applies to you, then you'll be interested in two recent changes in WP support: Canadian support is now provided from WPCorp's head office in Utah instead of from J.B. Marketing here in Canada, and WPCorp is now offering its customers a software subscription service for handling software updates.

Amidst these changes in WP support, UTCS would like to reassure you that we continue to support WordPerfect as in the past. (See the box following for some tips on dealing with common problems.) Call our Advising Office at 978-HELP if you're having any difficul

Support Consolidation in Utah

On March 15th, Canadian WP support was consolidated with U.S. support, to provide more timely and consistent information to Canadian users. Now available to answer your technical questions are 450 support operators (including several who speak French) at the following toll-free numbers:

WP General Questions:	1-800-321-3349
5.0 Features:	1-801-541-5096
5.0 Graphics:	1-800-321-3383
5.0 Installation:	1-800-533-9605
WP for the Macintosh:	1-800-336-3614
Printer Support:	1-800-541-5097
Networks:	1-800-321-3389
French Information:	1-801-222-5050

Although J.B. Marketing no longer provides WP support, it continues to market WP and to provide the same service to dealers as it has in the past. (Upgrades from WP 4.2 to 5.0 are available from J.B. Marketing for $90. Call Sylvie Lemieux at 283-2121, extension 229, to order. The Bitstream Fontware package is also available at no charge.)

New Software Subscription Service

The software subscription plan recently announced by WPCorp offers customers an effortless way to keep their software up-to-date. For a standard fee, subscribers will automatically be sent every release or update of the desired product within

WordPerfect Tips

1. Be sure to keep your serial number recorded in a safe, permanent place. This number (which begins with the letters WPP or WN) often appears only on the paper wrapper on the slipcase, and may be accidentally discarded. If you've lost your serial number, phone the WP General Questions line to obtain a new one.
2. If you're having problems with your version of WP 5.0, check the version date by pressing F3 (the Help key). The date is displayed in the upper right-hand corner of the Help screen. If your version is dated earlier than October 1988, phone Mary Wilson at 978-5601 to arrange to obtain a copy of a later, more bug-free version.
3. Incorrect printer definitions are a common problem with WP. Make sure you've installed the correct printer driver (phone 978-HELP for advice).
4. If you get an unexpected message asking "Overwrite file?", this is just the timed backup feature wanting to know if it should save the current version of your document. Under normal circumstances, choose "yes." (The backup functions are found under Setup on the F1 key.)
5. It's advisable always to keep backups of your documents. A fairly common WP problem is "Error 23", a DOS Write Error in which a document save isn't done properly (by the computer, not by the user). When such an error occurs, the file can no longer be opened. A backup copy of the document will allow you to recover from this problem.
6. If you'd like to learn how to use WP and would prefer to avoid the trial-and-error method, call Irene Rosiecki at 978-4565 to find out when our next WordPerfect courses are offered.

five working days of when it becomes available. This service is available for all WPCorp's products, but it will be most useful for large, frequently updated software such as WP 5.0. The plan may be purchased for IBMs, Macs, Amigas, Ataris, and Apples, with the customer selecting which products will be covered. Customers may cancel their subscriptions at any time.

The price of the service is based on the number of disks sent and the cost of the accompanying documentation. For 5.25-inch media, there's a flat rate of US$10 for up to 5 disks, and a charge of $1 for each additional disk; for 3.25-inch media, the $10 flat rate applies for up to 2 disks, with a charge of $2.50 for each additional disk. The price of documentation will depend on the size of the manual, with costs generally ranging from $10 to $30. A further $5 is charged to cover the cost of the Master Update Notices, which contain detailed descriptions of all the changes made to the software. Canadian customers must pay an additional $10 fee per order to cover shipping and handling. Customers subscribing for WordPerfect can expect the plan to cost them about US$200 per year.

For the individual user, the convenience of the service may not warrant the cost, but for a group of offices, a department, or a large research group, the necessity of keeping current will justify the expense.

To subscribe to the service, call the WP Software Subscription Hotline at 1-801-222-1400 between 8:30 a.m. and 10 p.m. (EST). Be prepared to give your Visa or MasterCard number (your account will be billed for each mailing), and the names and registration numbers of all the software you want covered by the plan.

UTCS Support for WordPerfect

The UTCS Advising Office handles general queries and problems over the phone. The advisors are available at 978-HELP, from 10 a.m. to 6 p.m. Monday through Friday. Program updates are available from Mary Wilson at 978-5601. Installation, update difficulties, and other complex WordPerfect problems should be addressed to Geoff Rockwell at 978-4548. ▨

Numerical and Scientific Software for Microcomputers

Andrzej Pindor
apindor@vm.utcs.utoronto.ca

SPSS/PC News

We have received a new module of SPSS/PC called "TRENDS". Anyone who has purchased a SPSS/PC license can add TRENDS to their SPSS/PC installation.

TRENDS provides tools for time series analysis of data. It includes a variety of identification, estimation, forecasting, and diagnostic methods. A range of analytical methods is available, from simple, basic tools to more sophisticated types of analysis. These include:

- Smoothing – you can use simple but efficient smoothing techniques that sometimes yield high-quality forecasts with a minimum of effort.
- Decomposition – you can break down a series into its components, saving the seasonal factors and trend, cycle, and error components automatically, for use in further analysis.
- Regression – you can build regression models using a variety of techniques, including regression with autocorrelated errors and two-stage least squares for solving simultaneous equations.
- ARIMA Modeling – you can apply the powerful techniques of ARIMA modeling in a fully interactive environment.
- Spectral Analysis – you can examine a time series as a combination of periodic cycles of various lengths.

Licensed users interested in adding TRENDS to their SPSS/PC installation should contact the UTCS Information Office at 978-4990 to arrange to borrow the diskettes.

SYSTAT Macintosh News

Several statistical products can be added to a SYSTAT installation to enhance the range of analysis that the software can perform. Four specific products are available for the Macintosh version of SYSTAT. They are DESIGN, TESTAT, LOGIT, and PROBIT.

DESIGN offers the following three capabilities:

- Estimation of sample sizes to obtain desired statistical power given an effect size and significance level; estimation of statistical power at specific sample sizes.
- Tables of expected mean squares for balanced experiments using the algorithm of Cornfield and Tukey.
- Randomization plans.

TESTAT tests summary statistics, reliability coefficients, standard errors of measurements for selected score intervals, and item analysis statistics for multiple item tests.

LOGIT offers logistic regression for binary and multinomial-dependent variables, estimated by maximum likelihood.

PROBIT provides appropriate methods for estimating a multiple regression model or analysis of covariance when the dependent variable is categorical and can take only one of two values.

These products are available at UTCS for demonstration purposes. If you are interested in examining them, contact Andrzej Pindor at 978-5045. Please note that these products are not included in the University of Toronto SYSTAT site license. You must purchase them directly from SYSTAT. Each module costs US$90.

TempleGraph: a Powerful Graphics Package for ATs and 386s

TempleGraph is a graphics program that can be used to produce publication-quality graphs and text charts from data stored in files, entered from the keyboard, or generated in the program using math functions. The data stored in files must consist of X,Y pairs; it can be edited, altered, and fit in several ways.

Specific graphing functions include two-dimensional cartesian graphs and polar plots. For both types of graphs, up to 10 curves and a total 2048 points may exist in the graphic editor at one time. Using so-called "meta files," you may produce a graph with an arbitrary number of curves, as well as an arbitrary number of graphs per page, with insets and overlays. The program provides a wide choice of plotting symbols, line types, fitting by straight lines or splines, and linear, semi-log, and log-log scales. What is particularly attractive about the package is its fully interactive nature; for example, when adding a legend or a label to a plot, you can move it around on the screen until it is positioned exactly with respect to the data being plotted. If the size is not quite right, you can decrease it or increase it on the plot and see how it looks. If you are not happy with the distribution of ticks, you can choose a menu option and see the change almost instantly. There is great flexibility in manipulating and modifying graphs, and the results can been seen immediately. (*Figure 1* shows some of the graphs that can be created with TempleGraph.)

Another attractive feature of the package is the way it handles data. Data stored in a file may be arranged in various ways, as in rows or columns, and TempleGraph will be able to read the data if you tell it about the arrangement. You can edit data with a graph of data in view by moving the cursor from point to point on the graph. You can see the numeric values of X and Y for each point and delete individual points, blocks of points, or entire curves. You can also "thin" the data by excluding every other point, once or repeatedly. It is worth noting that with a separate purchase of TBASIC, IEEE Bus data acquisition routines may be written, and TempleGraph can graph incoming data in real-time mode.

This power comes at a price, however. The program is not for the weak-hearted! Although the program is menu-driven, its decision tree is more like a jungle. Finding your way requires patience and perseverance; the possibilities of losing the trail are vast. I would recommend this program only if you do a lot of graphing and if you are very particular about the way your graphs look.

To make a hard copy of your graphs, you can send them to a 9-pin or 24-pin dot matrix printer (Epson LQ emulation mode or IBM b&w graphics mode) or you can create an HPGL file to be output on a variety of plotting devices.

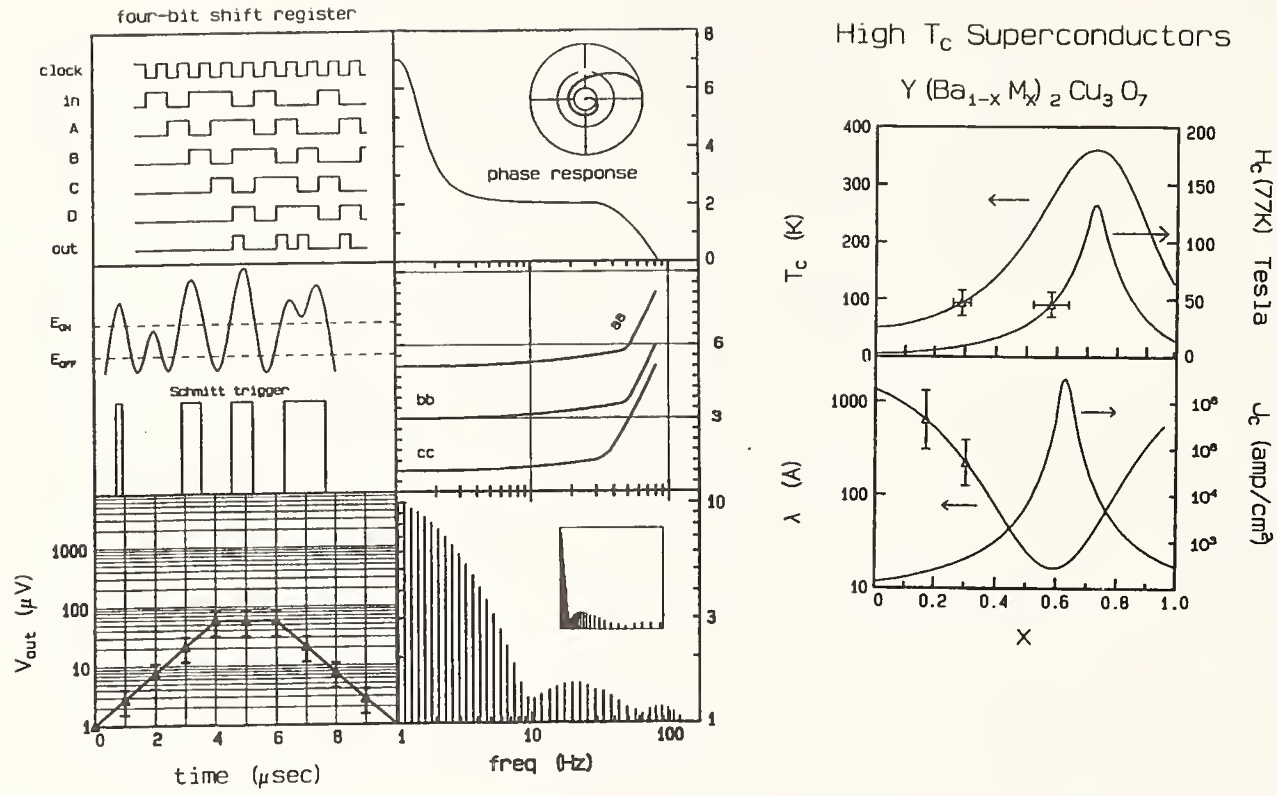


Figure 1: shows some of the graphs that can be created by TempleGraph.

TempleGraph was originally created at Temple University and is distributed now by MIHALISIN Associates. I would like to acknowledge the courtesy of Professor Adam Semlyen of the Department of Electrical Engineering, whose copy of TempleGraph I was able to examine.

Vendor: MIHALISIN ASSOCIATES, 600 Honey Run Road, Ambler, PA 19002, USA; (215) 646-3814.

Hardware requirements: IBM PC-AT or 386-based compatibles running DOS, at least 512KB RAM, and a hard drive.

Pricing: US$295 (academic price). The price includes three months of phone support to registered users. Additional support is available at US$100 per year. There are multicopy discounts also. A student version, called TempleGraphJr, is intended primarily for site licensing.

SOLVER-Q : Equation-Solving Software

Previously in *ComputerNews* we reviewed several packages that were either dedicated equation solvers (e.g., EUREKA) or that included solving sets of general (i.e., not necessarily linear) equations as a part of their features (e.g., GAUSS, MathCAD). *SOLVER-Q* has a number of advantages over these packages as summarized below.

SOLVER-Q is a program which can:

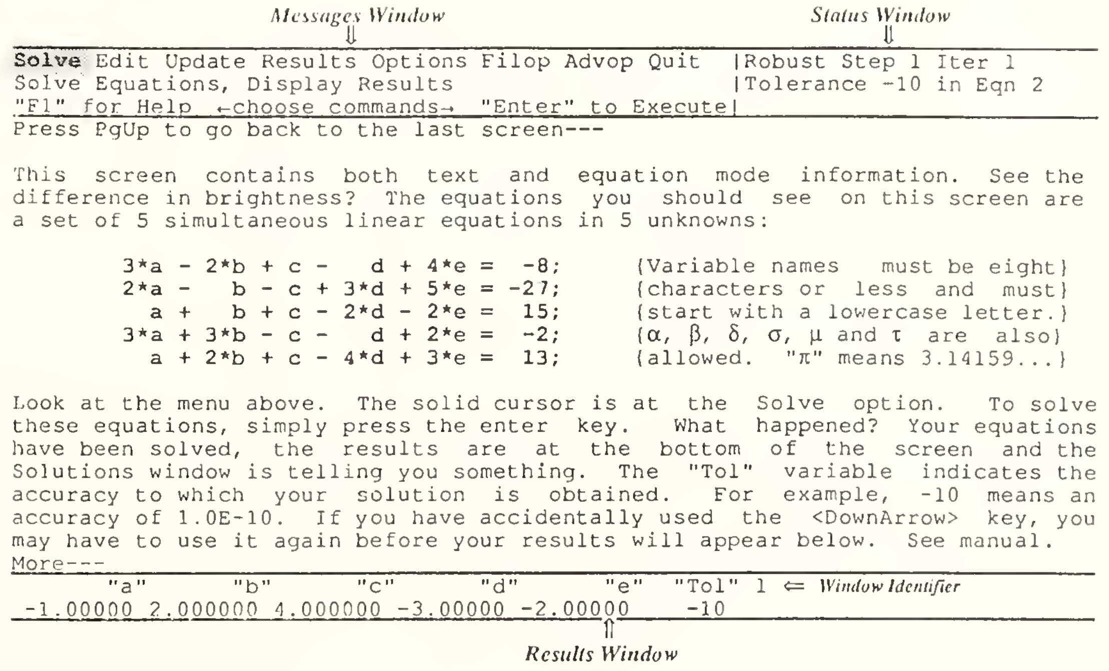
- Solve large sets of simultaneous nonlinear algebraic equations.
- Symbolically simplify, linearize, and find derivatives of nonlinear algebraic equations.
- Edit and test equations.
- Solve complex equations.
- Solve constrained and unconstrained optimization problems.
- Solve general regression problems.
- Symbolically eliminate and reduce equations.

SOLVER-Q's most significant feature is the ability to symbolically manipulate equations; not only will *SOLVER-Q* symbolically eliminate, reduce, and simplify equations, it will also find the Jacobian symbolically by taking derivatives of equations. It will then use this Jacobian in the search for a solution. In many cases, this considerably facilitates the process of finding a solution to a system of non-linear equations.

SOLVER-Q is a menu-driven program. There are always four windows present on the screen: **Message**, **Status**, **Equations**, and **Results**.

The **Message** window displays menus and items requiring user action, as well as on-line help screens. It also monitors the progress of *SOLVER-Q*. The **Status** window displays information about the operation of the program, mainly convergence or divergence of the solution and the tolerance achieved. The user never interacts with this window. The **Equations** window normally displays an equations file. This file can also contain ordinary text, but equations are easily distinguished by being highlighted. The **Equations** window is reached through the **Edit** command in the main menu. When in **Edit** mode, you distinguish ordinary text from equations by enclosing the text in curly brackets. The **Results** window, at the bottom of the screen, displays the solution of the equations. You can control which items are displayed in this window, as well as their format. Up to three different sets of results can be displayed in the window. All results obtained in a session are also stored in an external DOS file (with .PRN extention), which can be viewed at any time.

When you start up *SOLVER-Q*, you are automatically put into **Edit** mode and asked, in the **Message** window, for the name of an equations file. This file is expected to have an extension .ALG (for ALGebraic). *SOLVER-Q* makes a working copy of this file using the extention .TMP. (If you do not have an .ALG file, a .TMP file is created anyway.) In the **Equations** window, you modify the file or enter new information into it (e.g., equations you want to solve, starting values for unknowns, constraints on the variables) with optional explanatory text. As mentioned before, this text has to be distinguished from the equations and other relevant information by enclosing it in curly brackets. When editing is completed, you press <ESC> to go to the main menu. The **Equations** window displays the file without the curly brackets, with the equations highlighted. You start the solution process by choosing **Solve** from the menu and pressing <Enter>. *Figure 1* shows the screen after the equations have been solved.



```
Solve Edit Update Results Options Filop Advop Quit  |Robust Step 1 Iter 1
Solve Equations, Display Results                    |Tolerance -10 in Eqn 2
"F1" for Help ←choose commands→ "Enter" to Execute|
Press PgUp to go back to the last screen---

This  screen  contains  both  text  and  equation  mode  information.  See the
difference in brightness?  The equations  you  should  see  on this screen are
a set of 5 simultaneous linear equations in 5 unknowns:

       3*a - 2*b + c -   d + 4*e =  -8;     {Variable names   must be eight}
       2*a -   b - c + 3*d + 5*e = -27;     {characters or  less  and  must}
         a +   b + c - 2*d - 2*e =  15;     {start with a lowercase letter.}
       3*a + 3*b - c -   d + 2*e =  -2;     {α, β, δ, σ, μ and τ  are  also}
         a + 2*b + c - 4*d + 3*e =  13;     {allowed.  "π" means 3.14159...}

Look at the menu above.  The solid cursor is at  the  Solve  option.   To solve
these equations, simply press the enter  key.   What  happened?  Your equations
have been solved,  the  results  are  at  the  bottom  of  the  screen  and the
Solutions window is telling you something.  The  "Tol"  variable  indicates the
accuracy to which  your  solution  is  obtained.   For  example,  -10  means an
accuracy of 1.0E-10.  If you have accidentally used  the  <DownArrow>  key, you
may have to use it again before your results will appear below.  See manual.
More---
       "a"       "b"       "c"       "d"       "e"   "Tol" 1
 -1.00000 2.000000 4.000000 -3.00000 -2.00000     -10
```

Figure 2: SOLVER-Q Screen Organization. This example is taken from the Tutorial Lesson 2. Quotes in results title line are optional "Tol" denotes tolerance attained, in this case 1E-10.

Other options seen in the first line of the **Message** window in *Figure 1* expand into submenus. At each stage, help is available about the current (highlighted) choice. In general, moving around is easy and provides a lot of flexibility in the way equations are solved. It is possible to set up an iteration loop that will solve equations for a range of parameters or starting values (very handy when trying to solve a differential equation, for example). Another impressive feature is an option for automatically setting up and solving a least square problem. Given an equation containing parameters, and a table of values for dependent and independent variables, the problem of finding the optimum values of the parameters (in the least square sense) can be solved with a few key strokes.

SOLVER-Q also supports constrained and unconstrained optimization. Given a cost function and all constraints desired, you can ask *SOLVER-Q* to set up the Lagrangian for the problem, find the symbolic Jacobian, and solve the problem. You can do it step by step, as described, or ask *SOLVER-Q* to solve your optimization problem (it will generate the Kuhn-Tucker condition equations and proceed to solve them).

Complex equations are solved by reducing them to real equations. The letters **r** and **i** are appended to every complex variable to form two new real variable names for every complex variable. Complex values can be represented both in cartesian and in polar forms. Arguments to trigonometric functions can also be specified in degrees.

Besides a choice of several variations of the Newton method for solution algorithms, *SOLVER-Q* also offers two variations of Homotopy method (a powerful technique for difficult problems): Newton Homotopy and Complex Homotopy. Other Homotopy transformations can easily be implemented by users with the help of existing features of *SOLVER-Q*.

Generally speaking, *SOLVER-Q* is a friendly package, easy to use, and full of interesting features. The thing I did not like about the package is that although it uses several windows, flashy colours (which you can change to suit your tastes), and some Greek letters, no attempt has been made to make equations look natural: standard "typewriter" style is used. For more complicated sets of equations, this leads to legibility problems. Most microcomputers are equipped with graphics cards capable of legibly displaying mathematics (if software support is provided). Naturally, this software support would require additional programming effort which, considering the low price of *SOLVER-Q*, may not be worth the additional cost involved.

I have not attempted to apply the program to very demanding or large problems, but the manual claims that the program was used for sets of up to 1000 nonlinear equations.

SOLVER-Q was originally created at the University of Wisconsin and is now marketed by Scientific LOGICS. The program is distributed on two disks: one for the 8087/80287 version and one for the non-8087 version. A third disk contains a 27-lesson tutorial. A concise, fairly clearly written manual is included. ▒

Vendor: Scientific LOGICS Inc., 21910 Alcazar Ave., Cupertino, CA 95014, USA; (408) 446-3575.

Hardware requirements: IBM PC-XT, AT or compatible with one floppy drive and a hard drive, or two floppy drives; minimum 512KB RAM.

Price: The program costs US$95.

TLC Legacy 150 χ^2 Tape Backup

Terry Sanderson
sanders@gpu.utcs.utoronto.ca

Backups. It's a word that microcomputer users fear. Although backing up your hard disk is an essential part of computer use, it can be an extremely tedious and time-consuming task. Imagine backing up 30 megabytes (MB) of data on your hard disk to 360-kilobyte (KB) floppies using the DOS BACKUP command. This task would require over 80 floppies and several hours of your time — not something that many people look forward to.

Tape drives to the rescue! For several years, a number of manufacturers have produced *streaming tape drives* for PCs and compatibles. Essentially, these backup units are composed of a quarter-inch tape drive mechanism, a controller card, and backup software. They use a 4" by 6" tape cartridge, and are called "streaming" because of their method of operation: they operate at peak efficiency when the tape is moving past the read/write head at full speed, or "streaming" past the head. Since these devices operate exclusively as backup devices, they are not given a DOS drive letter and can only be accessed through the supplied software.

Tense Lectronix Corporation (TLC), a Canadian company, manufactures three such units, with storage capacities of 60MB, 150MB, and 320MB per tape. The unit we evaluated, a Legacy 150 χ^2 provides up to 150MB of backup storage on a single, industry-standard, DC600 cartridge tape. The package comes complete with an external tape drive unit, a controller card (to be inserted in an available expansion slot inside your machine), a cable, and SY-TOS tape backup software.

Installation and setup of the Legacy unit proved to be simple (the unit requires an I/O address, a DMA channel, and an unused interrupt), but if your machine contains unusual hardware — such as network cards, emulation cards, or other expansion cards that use DMA or interrupts — then some changes to the jumper settings on the tape controller card may be necessary. Unfortunately, with hardware such as this, installation may require the assistance of someone well-versed in the inner workings of PC hardware.

Installation of the SY-TOS software is straightforward, since an installation program is provided that creates a subdirectory and copies the required files from the floppy. If any settings on the controller card have been changed, a setup program must be run to make the associated changes to the tape software.

The SY-TOS tape software, fast becoming an industry standard because of its ease-of-use and flexibility, is gaining the support of many tape drive manufacturers. The software provides a Lotus-like command interface, allowing both first-letter and cursor-key selection of commands. The operating screen displays the command menu (at the top) and four windows labelled MESSAGES, DISK, TAPE, and STATISTICS. In the MESSAGES window, all messages to the user about the operation of the tape and software are displayed. The DISK window provides information about the hard disk, such as the total available space and the space in use; the TAPE window displays similar information about the tape currently in the drive. The STATISTICS window provides the user with information about the speed of the backup/restore operation.

Performing a full DOS disk backup is simple. Insert the tape, start the backup software, and then select **B**ackup **D**isk. The software will prompt you with this message:

```
Enter DISK letter(s) for a
DOS DISK BACKUP:
```

You respond by typing the letter of the disk you wish to back up. (You can also enter multiple DOS drive letters to back up more than one disk at a time.) The software then displays this prompt:

```
Enter a tape VOLUME NAME:
```

This allows you to give the tape a name, much like the DOS disk volume label. The name can be up to 47 characters long. Next, the software asks you if you wish to password-protect the tape:

```
Enter optional tape
PASSWORD, <Enter>
if none:
```

Following this exchange, the backup begins. In the STATISTICS window, a backup start time is displayed, along with a running count of the amount of data backed up. When the backup is complete, backup time and total time are displayed.

The software provides literally hundreds of options. Backups and restores can be of three types: DOS disk, DOS file, or device (useful when backing up disks that contain non-DOS partitions). With the **B**ackup **F**ile command, the files to be backed up can be either selected from a list or specified with the **S**et **S**elect command. Directory listings of both the tape and the disk can be performed, and a verification of the backup can be performed with the **V**erify **D**isk and **V**erify **F**ile commands. Journals containing the information appearing in the MESSAGES and STATISTICS windows can be written to disk, and a library can be created that contains a list of all the files/disks backed up, as well as each tape's volume label. The package also contains a facility called ST-BATCH, which allows users to create automated batch files for operating SY-TOS.

What about performance? If you are used to getting comfortable and taking a few hours to perform your backups, look out! On a Commodore PC40 III (a fast , 80286-based machine), backing up 16MB of data on a 20MB hard disk took the Legacy 150 χ^2 about 5.5 minutes (from starting the software to the completion of the backup), for a processing speed of about 3MB per minute. On an original IBM PC-XT, backing up 8.7MB of data on a 10MB hard disk took 6.6 minutes, for a speed of 1.3MB per minute. Both these rates are a great improvement over the time it takes to back up to floppies.

Sytron, the producer of SY-TOS, claims that its software is compatible with Novell Netware, IBM PC LAN, and 3-COM's 3+ software. The company also produces a version compatible with SCO Xenix. Sytron's documentation is well-written and properly structured, and it contains an excellent index.

TLC has put together an impressive package, combining a quality tape drive unit with SY-TOS software. Although this option is more expensive than backing up to floppies, these tape drives offer two major advantages: speed and convenience. In general, people will perform backups on a more regular basis if doing so does not inconvenience them.

If you need to back up large amounts of data regularly, investing in a Legacy unit may be well worth the price. If you choose not to invest, you may spend many hours re-creating those chapters that you didn't back up late last night. How much is **your** time worth? ▨

Do You Need a Right Hand Man?

Martha Parrott
parrott@vm.utcs.utoronto.ca

Right Hand Man (RHM) is a memory-resident, Jack-of-most-trades package that runs in an IBM environment. (A memory-resident program actually resides in RAM and can be accessed even when you are already inside another program.) RHM uses less than 66 Kilobytes of your RAM, but it has a wide range of functions designed to organize and save time: a basic text editor; a calculator; a file-management system that improves on the corresponding DOS commands; file transfer using XMODEM; electronic mail; an automatic dialer; a simple database program; and an appointment scheduler.

Right Hand Man is by no means the first package of this kind; a number of others, such as Sidekick, have been available for years. What's special about RHM? **It runs on all DOS-supported Local Area Networks.** In a department or office with a PC-based network, this means, for example, that individuals enter their appointments in RHM's calendar from their own workstations. When someone wants to schedule a meeting, RHM automatically finds the next occasion when all participants are free for a specified block of time. RHM then enters the selected time into the calendar for each person attending, and, if requested, sets an alarm to remind everyone to come. A new version, soon to be released, promises to take up even less RAM and allow interactive communication with other people on the network.

RHM is distributed by FUTURESOFT of Canada and retails at $165. UTCS has obtained a demonstration copy; if you would like to have a look at the package, please call Martha Parrott at 978-5071. ▨

Memory Upgrades for the Macintosh

Dariusz Dabek
dabek@gpu.utcs.utoronto.ca

Adding memory to the Macintosh can be a confusing endeavour. This article will attempt to de-mystify the process by providing background information about the various possible memory configurations.

Upgrades are performed with Single In-Line Memory Modules (SIMMs), which are pieces of plastic, 3.5 by 12.5 cm, with memory chips mounted on the top surface. SIMMs are available in two sizes: 256 kilobytes (KB) and 1 megabyte (MB). The modules fit into two banks of special sockets inside the machine. The Mac Plus and the SE have four sockets, and the SE/30, Mac II, Mac IIx, and Mac IIcx have eight (see Table 1).

Machine	Banks	Sockets per Bank	Total Sockets
Mac Plus	2	2	4
Mac SE	2	2	4
Mac SE/30	2	4	8
Mac II	2	4	8
Mac IIx	2	4	8
Mac IIcx	2	4	8

***Table 1**: Macintosh models and their expansion sockets*

There are two rules to remember when adding memory. First, a bank cannot be only partially filled. Second, a bank must be filled only with SIMMs of the same size — that is, either all 256KB or all 1MB modules.

The Mac Plus and the SE

Both the Plus and the SE have a standard configuration of 1MB of RAM, composed of four 256KB SIMMs. Pluses and SEs have the same memory expansion options; they differ only in the physical location of the components inside the machine. The possible configurations are as follows:

Total Memory	First Bank	Second Bank
512KB	2 x 256KB	empty
1MB	2 x 256KB	2 x 256KB
2MB	2 x 1MB	empty
2.5MB	2 x 1MB	2 x 256KB
4MB	2 x 1MB	2 x 1 MB

***Table 2**: Possible memory configurations for the Plus and the SE*

A 3MB configuration, for example, is not possible, because there is no combination of 256KB and 1MB SIMMs that — following the above rules — adds up to 3MB.

continued...

SE/30s and the Mac IIs

With SE/30s and the Mac II series, you have a choice of memory configurations: 1MB (4 X 256KB) or 4MB (4 X 1MB). In accordance with the rule that a bank cannot be only partially filled, these computers must be upgraded in combinations of four SIMMs. And, as with the Plus and the SE, the banks must be filled with SIMMs of the same size. The only memory configurations for these machines are the ones below:

Total Memory	First Bank	Second Bank
1MB	4 x 256KB	empty
2MB	4 x 256KB	4 x 256KB
4MB	4 x 1 MB	empty
5MB	4 x 1 MB	4 x 256KB
8MB	4 x 1 MB	4 x 1 MB

***Table 3:** Possible memory configurations for SE/30s and the Mac II series*

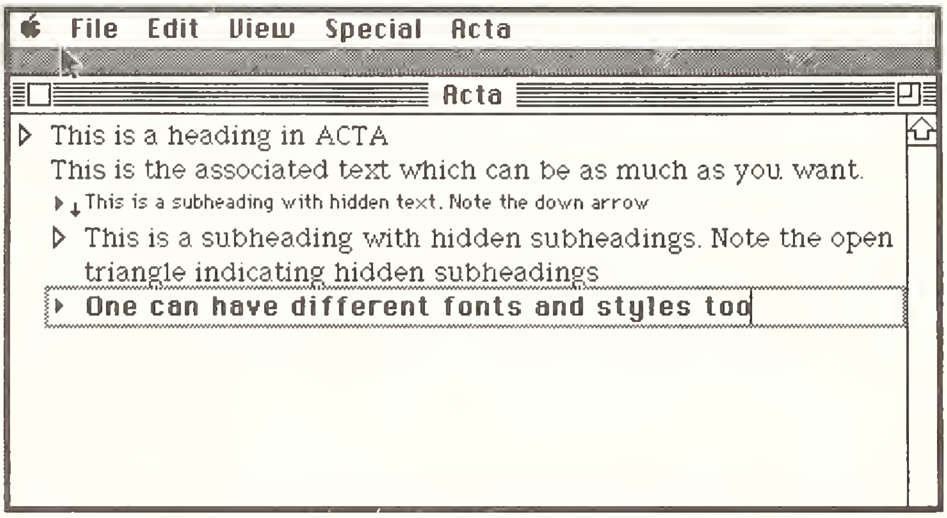
SE/30s and all Mac II machines can sometimes be fitted with additional memory for free. If you have a friend who is substantially upgrading an SE/30 or any Mac II, there will be leftover 256KB SIMMs. Spare Mac Plus and SE SIMMs may also work, but they must be Mac II compatible.

For more information regarding memory options on the Macintosh, call Dariusz Dabek at 978-8823, or send e-mail to dabek@gpu.utcs.utoronto.ca. ▒

Outline Applications on the Macintosh

Geoffrey Rockwell
rockwell@gpu.utcs.utoronto.ca

Can computers help you think? Decidedly not, but they can help you organize your thoughts. Two outline applications for the Macintosh, **ACTA** and **MORE II**, are part of a growing breed of software designed to help you organize ideas.



This is a heading in ACTA
This is the associated text which can be as much as you want.
This is a subheading with hidden text. Note the down arrow
This is a subheading with hidden subheadings. Note the open triangle indicating hidden subheadings
One can have different fonts and styles too

ACTA allows up to 99 levels of headings.

Outliners are to the traditional outline what word processors are to the essay. They allow you to enter headings and associated text, rearranging topics by clicking and dragging. Outliners let you decide how much of your outline you want to see. You can choose to see only the first level of headings or to expand a heading and see its subheadings. The combination of being able to collapse and expand headings and being able to move headings and their associated subheadings makes outliners a convenient tool for reorganizing ideas.

ACTA 2.0. is a Desk Accessory outliner. Properly installed, you can use it in conjunction with any word processor. You start by typing your headings. A heading can have subheadings and text associated with it. You can choose whether to see the text and/or the subheadings. Each subheading can have further subheadings and text. ACTA allows for up to 99 levels of headings.

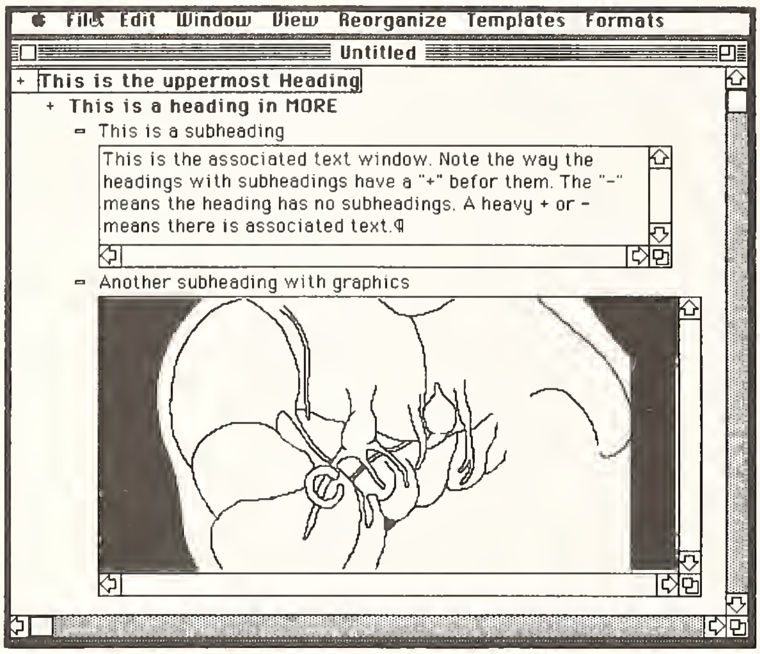
The mouse can be used to modify ACTA outlines. Double-clicking expands or collapses headings. Click-dragging moves headings and their associated subheadings. You can move headings vertically, in relation to other headings, or horizontally, turning them into subheadings.

While ACTA provides excellent outlining tools in an inexpensive and convenient package, it does not offer all the presentation features found in a product like MORE II.

MORE II is a full-featured, stand-alone outliner. Since it is not a desk accessory, it cannot be used easily with word processors unless you have sufficient RAM to run it under MultiFinder. MORE II also treats text differently than most word processors. In MORE II, any text associated with a heading is assigned to a separate window that is opened or closed. This is neither as convenient nor as fast as ACTA for entering subheadings or text in your outlines. On the other hand, MORE has presentation features. Any outline can be turned into a tree chart for exporting to graphics programs like MacDraw. Outlines can be transformed into bullet charts for presentations. You can also print a presentation on transparencies. MORE II gives you substantial control over the appearance of the bullet charts, while still automating the process of transformation.

Using Outliners

Are these tools useful? Outliners can be used, while writing, to organize ideas as a traditional outline would. While not as versatile as paper and pen (it is difficult to draw circles and arrows to designate relationships), electronic outlines can be reorganized without the use of scissors, tape, and glue. Electronic

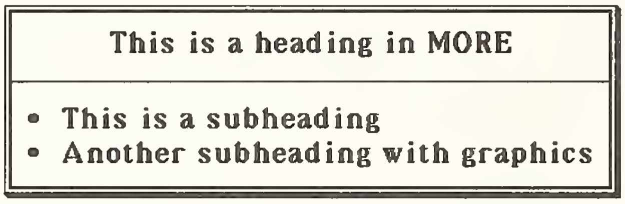


+ This is the uppermost Heading
  + This is a heading in MORE
    - This is a subheading

This is the associated text window. Note the way the headings with subheadings have a "+" befor them. The "-" means the heading has no subheadings. A heavy + or - means there is associated text.¶

    - Another subheading with graphics

This is what MORE in Outlining mode looks like.



This is a heading in MORE

- **This is a subheading**
- **Another subheading with graphics**

This is an example of the sort of bullet chart MORE can produce.

outlines can also be used to collect notes about a work in progress. For example, a reminder to check a reference can be entered under a "To Do" heading. Finally, an outline can be used as a scrapbook for text and ideas which have not yet found their place in a work in progress.

Will outliners improve your writing? They may help, by improving your organization or by allowing you greater freedom when reorganizing ideas. However, you can get caught in the trap of creating a paper by simply expanding the outline to the point that it says everything. A paper thus written may lack the unity and flow of a paper written sequentially. There is, after all, more to good writing than an obsession with organization. ▨

MORE II

Requires: Mac Plus or larger, 1 MB of RAM, 800KB floppy drive or a hard drive

Company: Symatec Corp., 10201 Torre Ave., Cupertino, CA 95014, USA; 800-441-7234

Note: MORE II comes with a complimentary copy of ACTA.

ACTA V2.0

Requires: Mac 512K or larger

Company: Symmetry Corp., 761 E. University Dr., Mesa, AZ 85203, USA; 602-844-2199

Can a Computer Add?

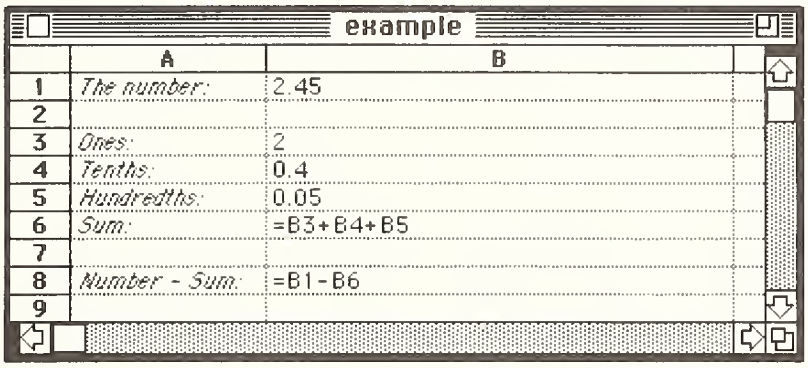
Dariusz Dabek
dabek@gpu.utcs.utoronto.ca

What is (2 + 0.4 + 0.05) - 2.45? If you said zero, your microcomputer will disagree with you.

Spreadsheets are one of the most popular applications for microcomputers. Cheque books, student grades, and corporate and departmental budgets are all being balanced with the help of Microsoft Excel or Lotus 1-2-3. The numbers in these worksheets are constantly tabulated by various formulas; changes can be made during a "what if" analysis, and the program is designed to recalculate all necessary entries faithfully, making sure all totals are in agreement. But does it?

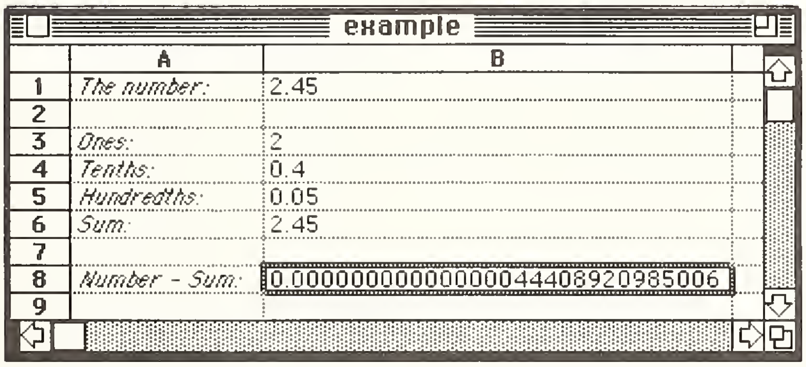
This article will show how very simple calculations can produce inaccurate results in a spreadsheet. The example used here was inspired by a recent incident in the UTCS Micro Lab.

Figures 1 and *2* show the same information displayed in two different ways: once as formulas (*Figure 1*) and once as values (*Figure 2*). Both figures show two methods of obtaining a total value of 2.45. The first method is just to enter the value (as in cell B1); the second is to add all the "parts" of the number — i.e., 2 + 0.4 + 0.05 (as in B6).



	A	B
1	*The number:*	2.45
2		
3	*Ones:*	2
4	*Tenths:*	0.4
5	*Hundredths:*	0.05
6	*Sum:*	=B3+B4+B5
7		
8	*Number - Sum:*	=B1-B6
9		

Figure 1: Sample spreadsheet calculations (displayed as formulas).



	A	B
1	*The number:*	2.45
2		
3	*Ones:*	2
4	*Tenths:*	0.4
5	*Hundredths:*	0.05
6	*Sum:*	2.45
7		
8	*Number - Sum:*	0.00000000000000044408920985006
9		

Figure 2: Sample spreadsheet calculations (displayed as values).

The formula in B8, *Figure 1*, calculates the difference between the entered value and the composite value. This difference is displayed in B8, *Figure 2*. We can see that the result is not zero. How can this be?

To explain this anomaly, let us examine the way in which the computer stores these numbers internally. Decimal numbers (often called base 10 numbers) are stored as binary (base 2) numbers — that is, as numbers composed of zeros and ones. Thus, both $(2)_{10}$ and its binary equivalent $(10)_2$ express the number 2.

Our example number may be expressed as $(2.45)_{10}$. The fractional part of that number — $(0.45)_{10}$ — will prove to be responsible for the inconsistency. The number 2 has an exact binary equivalent, namely 10, but $(0.45)_{10}$ has no exact binary representation. In fact, the closest we can come is $(0.01110111\cdots)_2$, a repeating pattern of "0111". Since a computer can store only a finite number of digits, an error will be introduced when the remaining "0111's" are cut off. This explains why our result in *Figure 2* was not zero.

Now that we understand why this inaccuracy occurs, how can we avoid it? In Excel the solution is simple: selecting "Precision as Displayed" from the Format menu will resolve the problem. In Lotus 1-2-3, the @RND() function performs an equivalent task.

For spreadsheet-related questions, please call UTCS Advising Services at 978-HELP. ▒

Mega CD-ROM: A Collection of Public Domain Software for the Macintosh

Jon Alexander
jon@vm.utcs.utoronto

Developments in microcomputer technology have made it possible to use compact disks (CDs) for storing and retrieving programs, text, and data. The CD has quickly become a popular way to distribute very large amounts of software in a single issue.

UTCS has recently received a copy of volume 2.0 of the Mega CD-ROM, a CD containing a large collection of software for the Apple Macintosh. A CD-ROM can be used in similar fashion to a fixed disk on a Macintosh computer; however, it is a read-only storage device, and cannot be modified. The Mega CD-ROM holds over 300 megabytes (MB) of Shareware and Public Domain software. (Shareware is software distributed for free, but for which the author requests a registration fee — which often entitles users to receive new versions of the software when these become available — if the program is kept or used; "Public Domain" describes software that the author has released into the public domain, such that it may be copied and used freely.) These types of software for the microcomputer have recently been gaining popularity as their quality improves and as people discover that their cost is often lower than that of commercial software with similar capabilities.

Using an Apple SC CD-ROM Reader, provided to the Apple Research Partnership Program (ARPP) by Apple, we have been able to mount the CD-ROM and look at its contents. The software is organized into folders by type of application. Among these folders are **Graphics** (which includes graphics, utilities, text applications, and games), **HyperCard Files**, **Desk Accessories** (DAs, to be installed under the menu), **Utilities**, and **Fonts** (some of which are designed for downloading and printing to a PostScript laser printer). The Font folder alone contains 826 files and occupies over 14MB of the disk.

Some of the other items on the Mega CD-ROM are described below:

BiPlane is a simple spreadsheet program with some of the features of more powerful programs like Microsoft Excel. In fact, it also has some capabilities that are not even available in other spreadsheet programs, such as individual text formats for each cell, with different fonts and sizes possible. The program, Version 1.01, comes in two formats: as a regular application, and as a DA. The application version can create a spreadsheet of 1000 by 1000 cells, a respectable size for a shareware program. BiPlane reads and writes spreadsheets in SYLK format, a common spreadsheet interchange format. We were able to move a spreadsheet file between Excel and the application version of BiPlane because they can both write and read in this format. BiPlane's author advertises that customization of the program is provided for a charge, on an individual basis.

The **McSink** desk accessory (Version 6.2) is used for altering text files. It is a text-formatting and word-processing utility with a wide variety of uses. For example, the text of this article originally contained a carriage return at the end of every line. With the aid of McSink, we were able to strip out the carriage returns, leaving one at the end of every paragraph. This made it possible to format the text. McSink is also handy in manipulating text files sent through electronic mail. If, for instance, you receive a file with a width of 80 characters (a typical width), you can reformat it to a different width with this DA. McSink is a shareware program; a commercial version called Vantage is also available.

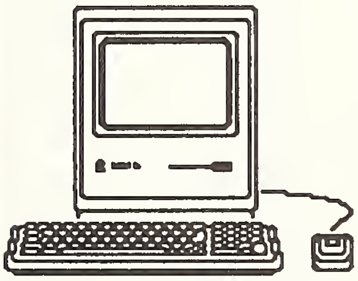
VisionLab (Version 0.65) allows conversion and simple modification of graphics images, including scanned images. It supports a wide range of graphics file types — GIF, PICT, MacPaint, ThunderScan Scan Image, GrayMapFile, PixelPaint, and EPSF — and it works with the MacVision digitizer directly. We moved an image, scanned on the Apple Flatbed Scanner, into PageMaker by translating the file from PICT to EPSF format with VisionLab.

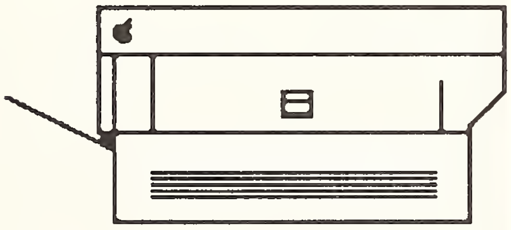
The **Sesame C** package is a C language compiler, with a small development system, for the Macintosh. It includes some basic C library routines, and looks like a reasonable way to begin developing C language programs for the Mac. It was not extensively tested.

The Utilities folder contains a collection of Multifinder utilities, including several particularly useful applications such as the **Graphic Load Average** program, which displays information about different tasks running under the Macintosh Multifinder, and **Revolver**, a group of utilities for setting a program to run automatically on a certain day of the week or month. One UTCS client intends to use Revolver to do regular, automatic backups of a Macintosh hard disk.

These items are just a tiny sample of the hundreds of programs and tools available.

The Mega CD-ROM normally retails for approximately US$35, and is available from QLTech Inc. of Coral Gables, Florida, USA. An arrangement can be made to view the Mega CD-ROM by contacting the UTCS ARPP Staff at 978-7828 and making an appointment.





Announcing ...

UTCS Apple Care

Now Available at the new Authorized UTCS Apple Repair Centre, 4 Bancroft Avenue, Room 103.

On site or Depot Servicing

Please Call: *978-6486*
978-5050

Also Available:

Maintenance contracts repairs and upgrades for IBM PCs and compatibles and Printers.

Documents at UTCS

All vendor-produced documentation may be ordered through the UTCS Information Office, Room 201, 4 Bancroft Avenue. UTCS documents and selected vendor documents are also stocked there for purchase. For more information on prices, call Dale Wright at 978-4990. Whenever feasible, documents are made available online, and users are encouraged to print their own copies. On the VM machine, a special command has been provided for this purpose.

To print online documents on:

IBM VM/CMS	***GP UNIX***
Type "help document"	Use *ipr* command

The following examples relate to the table below. The document to be printed is the UTCS Guide to Census Tapes, called CENSUS LISTING on CMS and /usr/doc/utcs/census on GP UNIX. <RETURN> means RETURN or ENTER key.

CMS:

```
document <RETURN> <RETURN>
laser census listing (forms yxle <RETURN>
```

GP UNIX:

```
nohup ipr -8p -fyxle /usr/doc/utcs/census & <RETURN>
```

UTCS Documents in hardcopy

New:

Previously announced:

Academic's Guide to Microcomputer Systems
Character Sets for Highspeed Printing
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics
UTCS GUIDE TO PRODUCTS AND SERVICES: Accounting
UTCS Catalogue: Numerical Products
UTCS Catalogue: Statistics Products
UTCS Catalogue: Text Products
UTCS Guide to Census Tapes
UTCS Guide to Kermit
UTCS Guide to Micro File Transfer Service
UTCS Guide to Text Processing on GP UNIX

UTCS Documents online

	CMS LISTING	GP UNIX	Forms Code
New:			
Previously announced:			
UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction	INTRO	/usr/doc/utcs/intro	*
UTCS GUIDE TO PRODUCTS AND SERVICES: Basics	BASICS	/usr/doc/utcs/basics	*
UTCS Catalogue: Access, Part 1	ACCESS1	/usr/doc/utcs/access1	*
UTCS Catalogue: Access, Part 2		/usr/doc/utcs/access2	*
UTCS Catalogue: Numerical Products	NUMCAT		*
Product-Function List	NUMLIST		BXQD
UTCS Catalogue: Statistics Products	STATCAT		*
Product-Function List	STATLIST		BXQD
UTCS Catalogue: Text Products	TEXTCAT	/usr/doc/utcs/textcat	*
UTCS Guide to BMDP	BMDP		*
UTCS Guide to Census Tapes	CENSUS	/usr/doc/utcs/census	*
Recipes for Using Tapes on VM/CMS	QUIKTAPE		*
UTCS Guide to FORTRAN on VM/CMS	FORTRAN		*
UTCS Guide to GP UNIX		/usr/doc/utcs/gpunix	*
UTCS Guide to Highspeed Printing	PRINT	/usr/doc/utcs/print	*

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Documents continued

UTCS Documents online continued

	CMS LISTING	GP UNIX	Forms Code
UTCS Guide to Kermit	KERMIT	/usr/doc/utcs/kermit	*
UTCS Guide to Micro Laser Printing Service	MICRLASR		*
UTCS Guide to SAS	SAS		*
UTCS Guide to SCRIBE	SCRIBE		*
(For printing instructions, see page 1 of document)			
UTCS Guide to Series/1 Terminal Use	SERIES		*
3270 Emulation:			
Cybernex APL100 and Volker Craig VC404	CYBER		*
DM1520	DM1520		*
Hardcopy Terminal	HARDCOPY		*
IBM 3101	IBM3101		*
IBM PC Kermit	PCKERMIT		*
SOROC IQ	SOROC		*
VT52	VT52		*
VT100	VT100		*
UTCS Guide to SPSS	SPSS		*
UTCS Guide to Text Processing on GP UNIX		/usr/doc/utcs/text	YXOG
UTCS Guide to TFW.MAK in SCRIBE	TFWMAK		*
UTCS Guide to VM/CMS	CMSGD		*
UTCS Guide to WSCRIPT	WSCRIPT		*
UTCS Rate Schedule (Commercial)	RATESCOM		†
UTCS Rate Schedule (External)	RATESEXT		†
UTCS Rate Schedule (Internal)	RATESINT		†

Other Documentation online

Electronic Mail			
A User's Guide to Electronic MAIL	MAILBOOK		YXOC
Kermit			
Kermit Protocol Manual	KERMITPM		YXOE
Kermit User Guide	KERMITUG		YXOF
ProComm			
ProComm Reference Manual	PROCOMM		YXOE
VMBATCH Documents			
VMBATCH User's Guide	VMBATCH		YXOA
VMBATCH Messages and Codes	VMBATMC		YXOA
VMSECURE			
VMSECURE User's Guide	VMSECURE		YXOE
VM Tape Documents			
TapeMap User's Guide and Reference	TAPEMAP		*
VMTAPE Messages and Codes	VMTMSGS		YXOE
VMTAPE User's Guide	VMTUSER		YXOE
Waterloo SCRIPT			
Reference Manual	WSCRPTRF		YXLC
User's Guide	WSCRPTUG		YXLC
Using SCRIPT in MVS/TSO	WSCRPTSO		YXLC
Waterloo SCRIPT and a PostScript Printer	WSCRPTPS		YXLC
Formula Processor Summary	WSCRPTFP		YXLC
GML User's Guide	GMLUG		YXLC
GML Reference Summary	GMLRFSUM		YXLC

* *Recommended forms code for the 8700 is YXLE unless otherwise stated.*
† *Use the 87set command. Type "help 87set".*

Consulting and Enquiries

Applications Support & Advising Supervisor	Alex Nishri	BC214	978-7109
External Marketing Consultant	Ihor Prociuk	BC217	978-6875
Erindale College	Joe Lim	ER2035	828-5311
Information Office	Dale Wright	BC201	978-4990
Account & Access Code Enquiries)	Sylvia May	BC101B	978-7148
IBM PC Maintenance	Kam Mark	BC103	978-5050
Tape Library (Academic Services)	Susan Kovago	MP368	978-7319
Tape Library (Administrative Services)	Miranda Fong	MP368	978-6693
Terminal Service	Rosi Tseu	BC105	978-7087
UTCS Noncredit Short Courses	Irene Rosiecki	BC217	978-4565

Consulting & Advising Services:	978-HELP
CMS, and GP UNIX userids:	ADVISOR
CMS Userid for mail problems:	POSTMSTR
System Status Enquiries (GP UNIX)	978-4318
System Status Enquiries (IBM)	978-7393
Interactive Services 300 (bps)	978-6200
Interactive Services 1200 (bps)	978-3959
Interactive Services 2400 (bps)	978-7239

UTCS Directory

Director:	Dr. Warren Jackson	BC118	978-8948	wcj@vm.utcs.utoronto.ca
Associate Director:	Eugene Siciunas	BC116	978-5058	eugene@vm.utcs.utoronto.ca
Managers:				
Communications &Technical Support	Norman Housley	BC121B	978-4967	norman@vm.utcs.utoronto.ca
Information Centre	Don Gibson	BC217	978-7331	don@vm.utcs.utoronto.ca
Internal Systems Support	Ron Vander Kraats	BC121A	978-4428	rvk@vm.utcs.utoronto.ca
Operations Support	Dr. Bob Chambers	MP350	978-7092	
Systems Support	Bill Lauriston	MP331	978-3579	bill@vm.utcs.utoronto.ca

Committees on Computing

Committee on Administrative Computing	Chair	Janice Oliver	978-4322
UTCS Board	Chair	Prof J.F. Keffer	978-4984
Supercomputer Users' Group at U of T	Chair	Prof. J.M. Ting	978-4971
Research Board Standing Committee on Computing	Chair	Prof. C.C. Gotlieb	978-2986

Legend

BC = Bancroft Building
ER = Erindale
MP = McLennan Physical Labs

* NetNorth/BITNET/EARN

UTCS Terminal and Advising Sites

Names and Locations

Central Advising Office (CAO), 978-HELP
Engineering Annex (EA, CDF), 11 King's College Road, Rooms 103, 107, 107B, 201, 203
Erindale College (Erin), 828-5339, Mississauga Road, Erindale Campus, Rooms 2037, 2039A-B-C, 2045
Robarts, Robarts Library, 130 St. George St., Room 1061A
Sidney Smith (Sidney), 100 St. George St., Rooms 1071, 2105
St.Michael's College, 121 St. Joseph St., Room 107
Trinity College, 6 Hoskins Ave., Room 024
Victoria University, 73 Queens Park Cres., Room 208

Access Hours

Sites	Hours of Access				Restrictions*	Advising
	Mon-Thurs	Fri	Sat	Sun		
CAO	10:00-18:00	10:00-18:00	closed	closed	Research	978-HELP
CDF	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	No
EA	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Erin (2039)∆	9:00-17:00	9:00-17:00	12:00-16:00	12:00-16:00	Research	Rm 2005
(2045-46-47)	24 hrs	24 hrs	24 hrs	24 hrs	Undergrads	Rm 2005
(235)†	8:00-22:00	8:00-17:00	closed	closed	None	Rm 2046
Robarts	8:30-24:00	8:30-24:00	9:00-22:00	13:00-22:00	None	978-HELP for Research
Sidney	7:00-24:00	7:00-24:00	7:00-24:00	7:00-24:00	None	978-HELP for Research
St.Michael's	24 hrs	24 hrs	24 hrs	24 hrs	None	978-HELP for Research
Trinity	8:00-22:00	8:00-22:00	8:00-22:00	8:00-22:00	None	978-HELP for Research
Victoria	8:30-21:00	8:30-21:00	8:00-13:00	8:00-13:00	None	978-HELP for Research

Sites	Advising Hours
CAO	Monday through Friday, 10:00 - 18:00
Erin	Monday through Friday, 09:00 - 22:00

Legend

* Research includes graduates, faculty, staff.
∆ Key access available.
† Access restricted to building hours.

Terminal and Printer Access

Sites	PACX	Network Terminal Server	Printers	CDF/PC Terminals
CDF	N	N	Y	N
EA	Y	N	Y	N
Erin	Y	Y	Y	N
Robarts	Y	N	Y	Y
Sidney	Y	N	Y	Y
St.Michael's	Y	N	Y	Y
Trinity	Y	N	Y*	Y
Victoria	Y	N	Y*	Y

(Y=yes, N=no)

* CDF/PC only

UTCS Services

UTCS Centrally Owned and Managed

Systems

IBM VM/CMS

- General Purpose Timesharing; access to NetNorth, BITNET, and EARN networks; access to the Internet
- 4381 P02 processor, 32 megabytes of memory
- CP operating system, VM/SP HPO R4.2
- CMS timesharing system, VM/SP Release 4
- RSCS spooling system, Release 3

GP UNIX
Technical Assistance: 978-8853

- General Purpose Timesharing under SUN UNIX 3.2
- SUN 3/280, 8 megabytes of memory
- access to Linotronic typesetter
- offers a sophisticated and powerful environment for text processing
- offers a sophisticated programming environment suitable for commercial software development or testing
- full access to USENET, an electronic technical information exchange facility
- offers excellent electronic mail facilities and ability to send or receive mail from most computer networks worldwide, such as UUCPNET, ARPANET, NetNorth, BITNET, CSNET, CDNNET

Services

Communications & Technical Support
Primary Phones: 978-3787, 978-4967

- Communications Group provides communications systems, terminals, modems, data channels: consulting and installation.
- Field Service Group installs and maintains communications and computer systems, particularly IBM PCs, Micro Vaxes, and Macintoshes, on a contract basis or on a cost-per-call basis.
- provides consulting on computer systems technology and installs computer systems
- provides access between the IBM systems and machines using UNIX, VMS and other operating systems. Ethernet, Pronet, and IBM TRN technologies are used over various transmission media including optical fibre. More basic communications techniques are also used for moderate speed links.
- provides consulting on local area networking and installs LANS
- provides access to NetNorth (BITNET), the North American Universities Network; ONET, the Ontario Regional Network; and USENET, the UNIX networking fraternity
- provides gateway to the US Internet
- will provide a communications solution to department needs on a contractual basis

Information Centre
Primary Phone: 978-HELP

- Provides assistance in use of electronic messaging, including use of Local Area Networks (LANS); NetNorth/BITNET/EARN, the world Universities network; CDNNET, the Canadian X.400 network; ARPANET; CSNET; USENET; and other international connections.
- provides advising, consulting and documentation on:
  - command languages, including CMS and UNIX
  - high level languages, including FORTRAN, and PL/I
  - packages and libraries, including SAS, SPSS-X, BMDP, IMSL, and NAg
  - editors and formatters, including XEDIT, ed, nroff/troff
- provides general micro support
  - selection consulting for hardware and software
  - Micro Lab for evaluation of hardware and software
  - advice on University discounts
  - media conversion and data transfer
  - operates UTCS Microcomputer Bulletin Board System
  - offers Micro Laser Printing Service
  - offers 35mm slide production service using Polaroid Palette
  - administers Local Area Network of PCs for Education Facility
  - administers Macintosh Education Facility
- high quality typesetting
- installs and maintains application packages
- provides short courses and seminars on the more popular services and software packages

> *The mandate of UTCS is to encourage and support the use of information technologies across campus, and to plan, implement, and operate common-carrier networks and certain appropriate central computer facilities.*

Facilities Managed by UTCS

Administrative Computing

- administrative IMS, DB2, Batch, and TSO
- 3018K processor, 48 megabytes of memory
- MVS/XA operating system

Computer Disciplines Facility/UNIX

SUN 3/280s, 8 megabytes of memory (zero.cdf)
- Computer Science interactive access
- SUN UNIX 3.5

SUN 3/280s, 16 megabytes of memory (one.cdf)
- Computer Science interactive access
- SUN UNIX 3.5

Computer Disciplines Facility/PC

- 97 TI Professional Computers connected in a Local Area Network
- introductory Computer Science instruction
- MS-DOS with Turing environment

Erindale College Systems

VAX 8200, 8 megabytes of memory
- instructional access using VMS
- research access

VAX-11/750, 5 megabytes of memory
- instructional access using UNIX (Berkeley UNIX 4.3BSD)

Institutional Relations System

VAX-11/750, 8 megabytes of memory
- database services to the owner departments using VMS

EPAS Facility

- 4361-5 processor, 16 megabytes of memory
- general VM/CMS services to the owner departments

Ontario Centre for Large Scale Computation (OCLSC)

- Cray Research Inc. X-MP/24
- 2 processors, 4 megawords main memory
- solid state disk (SSD) with 64 megawords of storage
- COS 1.17 operating system
- VAX 8350 + MicroVAX II and VAX750 provide VMS front-end services

Software List

SOFTWARE LIST for MICROCOMPUTERS

The following are microcomputer software packages for which UTCS can provide either support or some information. As with mainframe products, micro packages receive full support (Class A), limited support (Class B), or no active support (Class C). The specific criteria differ from those for mainframe classes and are outlined in the Academic's Guide to Microcomputer Systems.

Package/Compiler	Version	Environment	Support
Application Development Tools			
Assembler			
Microsoft Assembler	5.1	MS-DOS 3.3 & OS/2	B
MPW Assembler	2.0.2	Macintosh	B
BASIC			
GW BASIC	—	MS-DOS	B
C			
Microsoft C	5.1	MS-DOS	B
MPW C	2.0.2	Macintosh	B
WATCOM C & Express C	6.0	MS-DOS	B
FORTRAN			
IBM FORTRAN/2	1.0	MS-DOS 3.3 & OS/2	B
Language Systems FORTRAN	1.0	Macintosh	C
Microsoft FORTRAN	4.0	MS-DOS	B
WATCOM WATFOR-77	3.0	MS-DOS	A
Pascal			
MPW Pascal	2.0.2	Macintosh	C
TURBO Pascal	—	MS-DOS	B
Tools			
ResEdit	1.2d0	Macintosh	B
HyperCard	1.2.1	Macintosh	A
Macintosh Programmer's Workshop	2.0.2	Macintosh	B
WATCOM GKS	1.3	MS-DOS	B
Communications			
File Transfer & Terminal Emulators			
Kermit	0.8(35)	Macintosh	A
Kermit	2.30	MS-DOS	A
Kermit	—	Apple II DOS	C
Kermit	—	CP/M	C
Lap-Link DeskLink	1.0	MS-DOS	B
Lap-Link Mac	1.2	Macintosh	B
Lap-Link PC	2.16	MS-DOS	B
MacTerminal	2.2	Macintosh	B
PC TALK3	—	MS-DOS	C
PC PLOT III	—	MS-DOS	C
ProComm	TU 2.4.2	MS-DOS	A
Red Ryder	10.3	Macintosh	B
Network Systems			
AppleShare	2.0.1	Macintosh	B
Novell Advanced Netware	2.0a	MS-DOS	B
STARLAN	—	MS-DOS	B
TOPS	2.0	Macintosh	B
TOPS	2.0	MS-DOS	B
Network System Utilities			
Inter•Poll	1.0	Macintosh	C
Database Managers			
4th Dimension	Int. 1.03	Macintosh	B
Archivist	1.02b	MS-DOS	B
AskSam	3.0	MS-DOS	B
Clipper	S87	MS-DOS	B
DATAEASE	2.5	MS-DOS	B
dBASE II	—	CP/M	B
dBASE III Plus	1.1	MS-DOS	A

Software List continued

Package/Compiler	Version	Environment	Support
dBASE IV	1.0	MS-DOS	B
FoxBASE Mac	1.10	Macintosh	B
Notebook II	2.03	MS-DOS	C
REFLEX	—	MS-DOS	B
ZyINDEX	—	MS-DOS	B
Desktop Publishing			
Fontographer	n/a	Macintosh	C
PageMaker	3.01	Macintosh	A
PageMaker	3.0	MS-DOS	A
Ready Set Go	4.0	Macintosh	C
Ventura	2.0	MS-DOS	B
XPress	1.0	Macintosh	C
Electronic Mail			
Microsoft Mail	1.36	Macintosh	B
QuickMail	1.0	Macintosh	B
Graphics			
Charting			
35mm Express	4.02	MS-DOS	B
Cricket Graph	1.2	Macintosh	C
Freelance Plus	3.0	MS-DOS	B
Harvard Graphics	2.1	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
SigmaPlot	—	MS-DOS	C
Draw and CAD			
Aldus Freehand	1.0	Macintosh	B
Cricket Draw	1.1	Macintosh	C
Generic CADD	3.0	MS-DOS	C
MiniCad	4.05	Macintosh	C
Illustrator	1.0	Macintosh	B
Illustrator88	1.6	Macintosh	B
MacDraft	1.2b	Macintosh	C
MacDraw	1.95	Macintosh	A
MacDraw II	1.0v1	Macintosh	B
Windows Draw	1.02	MS-DOS	C
Image and Scanning			
Corel Draw	1.00	MS-DOS	B
ImageStudio	1.05	Macintosh	B
Publish Pac	2.0	Macintosh	B
Publish Pac	2.1	MS-DOS	B
Text Pac	2.0	MS-DOS	B
Paint			
DR HALO	1.23	MS-DOS	C
MacPaint	2.0	Macintosh	A
Microsoft Paintbrush	2.0	MS-DOS	C
PC Paintbrush	2.5	MS-DOS	C
SuperPaint	1.1	Macintosh	B
Windows Paint	2.03	MS-DOS	C
Plotting Subroutines			
WATCOM GKS	1.3	MS-DOS	B
Numerical			
Derive	1.14	MS-DOS	C

Software List continued

Package/Compiler	Version	Environment	Support
Eispack	n/a	MS-DOS	C
Eureka	n/a	MS-DOS	C
GAUSS	2.0	MS-DOS	B
Linpack	n/a	MS-DOS	C
MathCAD	2.0	MS-DOS	C
muMATH-83	4.12	MS-DOS	C
NAg Workstation Library	Rel. 1	MS-DOS	A
Solver-Q	---	MS-DOS	C
Operating Systems			
IBM PC, PS/2, and compatibles			
AIX PS/2 (Unix)	1.1	n/a	C
IBM OS/2	1.0	n/a	B
IBM PC-DOS	4.0	n/a	B
Microsoft MS-DOS (incl IBM PC-DOS)	3.2	n/a	A
Microsoft Windows 286	2.1	MS-DOS	A
Microsoft Windows 386	2.1	MS-DOS	A
OS/2 Extended	1.1	n/a	B
Macintosh II, Macintosh SE, and Macintosh Plus			
A/UX (Unix)		n/a	C
Finder	6.1	n/a	A
MultiFinder	6.0.1	n/a	A
System	6.0.2	n/a	A
NeXT			
NeXT	0.9	n/a	B
Apple II			
Apple II DOS	3.3	n/a	C
CP/M	2.20	n/a	C
ProDos	1.0	n/a	C
Sound			
SoundWave	1.0	Macintosh	B
MacRecorder	1.0	Macintosh	B
Spreadsheet			
APPLEWORKS	—	MS-DOS	C
HAL	1.0	MS-DOS	B
Lotus 1-2-3	2.01a	MS-DOS	B
Microsoft Excel	1.5	Macintosh	B
Microsoft Excel	2.0	MS-DOS	B
Multiplan	1.5	Macintosh	C
Statistical			
BASS	88.10	MS-DOS	C
MACSPIN	1.5	Macintosh	C
Minitab	82.1.1	MS-DOS	C
PowerStat	1.04	MS-DOS	C
SAS/PC	6.03	MS-DOS	A
SPSS/PC+	3.0	MS-DOS	A
STATPRO	2.0c	MS-DOS	C
STATWORKS	1.2	Macintosh	B
SYSTAT	3.2	Macintosh	B
SYSTAT	3.2	MS-DOS	B
Word Processing			
Guide	2.0	MS-DOS	C

Software List continued

Package/Compiler	Version	Environment	Support
FinalWord II	2.0	MS-DOS	C
MacWrite	5.01	Macintosh	B
Manuscript	2.0	MS-DOS	C
Microsoft Word	3.01	Macintosh	A
Microsoft Word	4.0	MS-DOS	A
Nota Bene	3.0	MS-DOS	B
Nota Bene SLS	3.0	MS-DOS	B
PC-TeX	2.1	MS-DOS	B
Sprint	1.0	MS-DOS	B
T^3	—	MS-DOS	C
Volkswriter Scientific	—	MS-DOS	C
WordPerfect	4.2 & 5.0	MS-DOS	A
WordPerfect	1.0	Macintosh	C
WordPerfect Library	2.0	MS-DOS	C
WordStar	3.3	MS-DOS	B
Utilities			
Apple Turnover	—	MS-DOS	A
FASTBACK	—	MS-DOS	B
Norton Utilities	4.0	MS-DOS	A
Copy II Disk	7.1	Macintosh	B
Mace Utilities	—	MS-DOS	B
MacZap	5.1	Macintosh	B
Sidekick	—	MS-DOS	B
SuperKey	—	MS-DOS	C
TURBO Lightning	—	MS-DOS	C
XenoCopy PC	1.117	MS-DOS	A

SOFTWARE LIST for MAINFRAME COMPUTERS VM/CMS, UNIX

Each programming language or package available at UTCS has a support level. In general, Class A Products receive full support, Class B limited support (as time and resources allow), Class C no active support.

For complete details of UTCS product support policy, see the UTCS GUIDE TO PRODUCTS AND SERVICES: Introduction.

Package/Compiler	System	Support	Version
Communications			
Kermit	VM/CMS	A	---
Kermit	UNIX	B	4C(058)
FTS	VM/CMS	A	---
MAIL/MAILBOOK	VM/CMS	A	86.359
MICROLASER	VM/CMS	A	---
macget/macput	UNIX	C	---
netcopy, netexec, to (NetNorth Tools)	UNIX	B	---
xmodem	UNIX	C	---
ftp,rsh,rlogin,telnet,rcp (Access via TCP/IP to most of the networked machines on all three campuses)	UNIX	B	---
rn/Pnews	UNIX	B	---
mail,mh,Mail	UNIX	-	---
Graphics			
PLOTBASIC (FORTRAN)	VM/CMS	C	---
SAS/GRAPH	VM/CMS	A	5.16, 5.18
Languages			
ASSEMBLER(F)	VM/CMS	C	---
Concurrent Euclid	VM/CMS	C	1.9
FORTUTILS	VM/CMS	A	2.2
PL/I OPT Compiler	VM/CMS	B	1.5.1
REXX	VM/CMS	A	---
SNOBOL 4	VM/CMS	C	3.5
Turing	VM/CMS	C	---
VS FORTRAN	VM/CMS	A	1.4.1
VS Pascal	VM/CMS	C	2.2
Waterloo C	VM/CMS	C	1.3
WATFIV	VM/CMS	C	V2L0
WATFOR-77	VM/CMS	A	1.3
cc	UNIX	A	---
f77	UNIX	C	---
ratfor	UNIX	C	BSD std.
ttc	UNIX	C	---
pc	UNIX	C	BSD std.
yacc	UNIX	C	---
awk	UNIX	C	---
adb,dbx	UNIX	C	BSD std.
Numerical			
IMSL	VM/CMS	A	9.2,10.0
LINPACK	VM/CMS	C	---
MINOS	VM/CMS	C	5.1
MINPACK	VM/CMS	C	---
NAg	VM/CMS	A	Mark 11
Statistical			
BMDP	VM/CMS	A	Level 85, Level 87
Minitab	VM/CMS	B	5.1
NAg	VM/CMS	A	Mark 11
NTSYS	VM/CMS	C	1987
SAS	VM/CMS	A	5.18
SPSS^{x}	VM/CMS	A	2.2

Package/Compiler	System	Support	Version
Text Processing			
SCRIBE	VM/CMS	C	4(1400)-1
Waterloo SCRIPT	VM/CMS	B	86.1
XEDIT	VM/CMS	A	---
8700 Pseudotypesetting	VM/CMS	C	n/a
MICROLASER	VM/CMS	A	---
ed	UNIX	A	---
vi	UNIX	C	---
cmacs	UNIX	C	---
spell	UNIX	C	---
diction/explain	UNIX	C	---
eqn	UNIX	B	---
tbl	UNIX	B	---
pic	UNIX	C	---
troff	UNIX	B	---
nroff	UNIX	B	---
TeX	UNIX	C	---
Utilities			
FORTUTILS	VM/CMS	A	2.2
TPRINT	VM/CMS	C	---
crypt	UNIX	A	BSD std.
compress	UNIX	C	BSD std.
csh	UNIX	B	BSD std.
diff	UNIX	A	BSD std.
grep	UNIX	A	BSD std.
ipr	UNIX	B	---
learn	UNIX	C	BSD std.
patch	UNIX	C	---
sed	UNIX	A	BSD std.
sort	UNIX	A	BSD std.
sh	UNIX	A	BSD std.
tar	UNIX	A	BSD std.
uniq	UNIX	A	BSD std.

Cut Here

UTCS *ComputerNews* Subscription Request Form

If your wish to have your name and/or address added, changed or deleted from our *ComputerNews* mailing list, please complete this form.

☐ **ADD**

☐ **CHANGE**

☐ **DELETE** **MY NAME AND ADDRESS.**

NAME, ADDRESS and TELEPHONE, in full	PREVIOUS NAME and ADDRESS, in full (or include your old mailing label)

☐ Check here if you can receive *ComputerNews* by campus mail.

Comments on this issue of *ComputerNews.*

—————————————— FOLD HERE ——————————————

Return to:

ComputerNews
University of Toronto Computing Services
4 Bancroft Avenue, Room 217
Toronto, Ontario
M5S 1A1